New Zealand
JOURNAL OF AGRICULTURE

HUNGRY MILLIONS STILL ENTREAT: 'FOOD! FOOD!'

IMPERIAL MYCOLOGICAL INSTITUTE
20 JUL 1945

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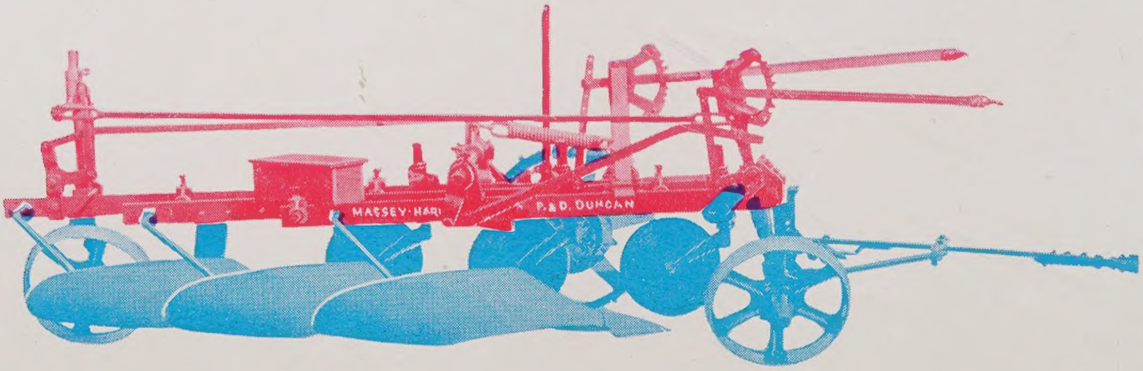

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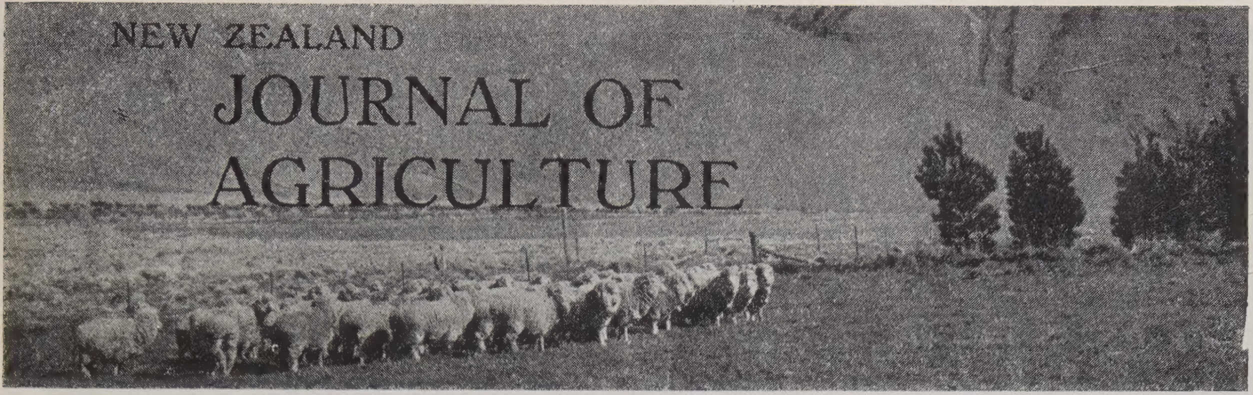


NEW ZEALAND
JOURNAL OF
AGRICULTURE

Vol. 70, No. 5. Published by Direction of Hon. B. Roberts, Minister of Agriculture. May 15, 1945.

FOOD FOR ALLIED FORCES

American Appreciation

APPRECIATION by American authorities of the efforts of New Zealand farmers in producing food for Allied forces in the Pacific has frequently been expressed to the Hon. the Minister of Agriculture. The United States Joint Purchasing Board has asked that the following message should be printed in the "Journal" to convey its thanks to New Zealand producers.

AS the production totals of current season's crops continue to add up, it becomes increasingly evident that you have again turned in a magnificent job in bringing forth increased quantities of high-quality foodstuffs. That this job was done under handicaps at times of a shortage of equipment, materials, and manpower enhances the credit due. Also the forces of nature in rain and flood have added to your difficulties.

This is the third farm year in which your good work has been evident to the United States Joint Purchasing Board, and we are grateful for this means of expressing our thanks to you for the success achieved, and to give some idea of the immediate tasks yet to be done.

Facts and figures of your production efforts tell a most interesting story. The commitments we receive on meats and dairy products, based on your pre-war export grades and standards, have met our every desire, and it is our belief we have used each wisely. The perishable and processed fruits and vegetables should be a special source of pride to your farming industry, for, to a considerable degree, production in this sphere constitutes new and added war effort on your part.

In 1942-1943 the demand for fruits and vegetables started to multiply. Demand soon expanded past all possible supply, and the aggressive efforts that followed to expand total production are well known. But do you realise how successful these efforts were? Often details of less significant fact or accuracy in war food production obscure the main story. The total short tons of perishables packed for our use in 1942-43 increased over 1941-42 by 600 per cent. Deliveries in 1943-44 again mounted more than 100 per cent. over the previous year. Now we are engaged in handling the volume committed for the 1944-45 season. This, if normal commitments are kept, will again show a 70 per cent. increase, or 2,000 per cent. over 1941-42. The anticipated shortage in potatoes has long since been absorbed in extra cabbage; one half of the annual quota on cabbage was actually exported in the first quarter of the year.

Without divulging further information that may have military significance, we wish to impress on all New Zealand farmers that their efforts are of inestimable value. Our operations in your country call for no undue direct contact with farmers; neither do they provide any special means of telling you the part your work has meant to us. Thus the opportunity this message provides is greatly appreciated.

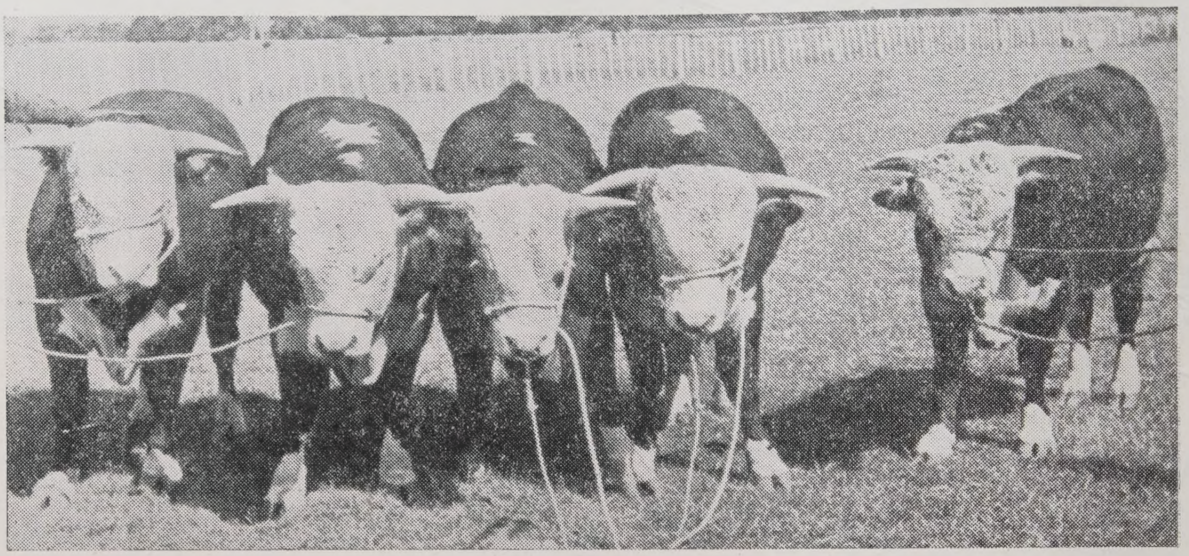
The real significance of food in the Allied war effort has never been more emphatically presented than at the present time. With all military forces making continued startling advances on every front, New Zealand farmers can be assured their foodstuffs are in the thick of this fight. Four days following the initial landing on Iwo Jima, a reefer ship of New Zealand produced and packed food stood by to augment other food supplies so critically needed at that particular place at the right moment.

Production efforts to date have been magnificent, and, despite the usual hazards in farming, we feel sure new records will again be achieved in 1946.

The U.S. Joint Purchasing Board.

Wellington, N.Z., April 23, 1945.

BRED, FED and RAISED ON WONDER



Selected young Hereford bulls, the property of Messrs. Harris Bros., Gisborne. At the recent Gisborne Hereford Fair, a line of fifteen bulls from the Harris Stud averaged 85 guineas each.

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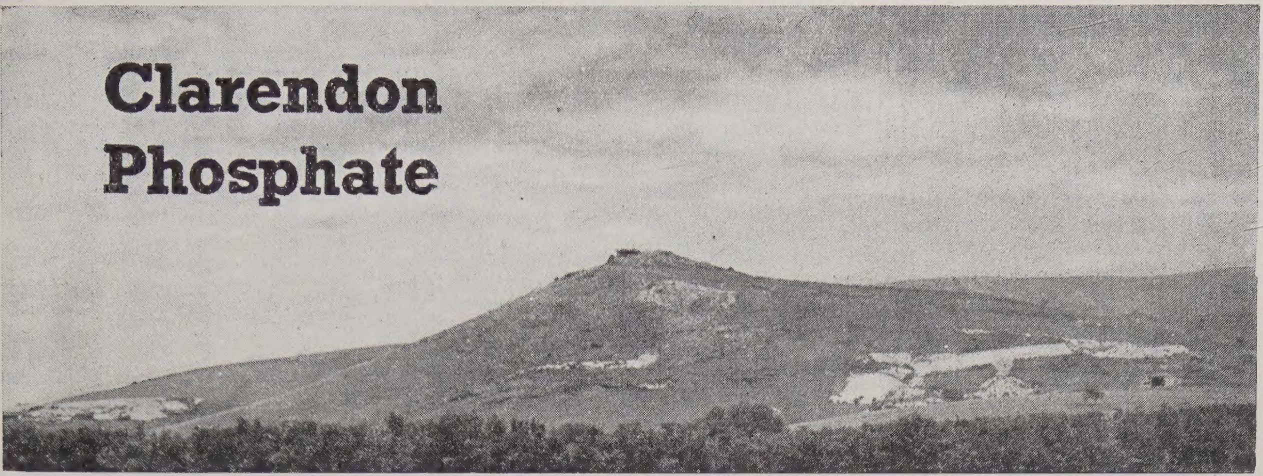
FACTORIES AT PALMERSTON NORTH, CHRISTCHURCH AND TE AWAMUTU.

Clarendon Phosphate



THE shortage of supplies of rock phosphate from overseas sources following the outbreak of war in Europe made it imperative to have a check-up on the possibility of obtaining phosphate locally. As Clarendon was well recognised as being a likely area, investigations were commenced in this district.

By

I. L. ELLIOTT,
Supervisor of Fertiliser Supplies,

and

A. G. ELLIOTT,
Crop Experimentalist,
Wellington.

CLARENDON is the name of a railway station and district just north of Milburn, which is itself some 30 miles south by main road and rail from Dunedin. Anyone who imagined the phosphate deposits would lend the locality an unusual appearance would be greatly mistaken. Actually there is nothing unusual in the appearance of the deposits as outcrops round the face of a pleasantly-contoured hill. This hill is for the most part in good pasture, but is insufficiently outstanding from the remaining countryside to suggest that its fertility has been increased to any considerable extent by the phosphate deposits.

Early Working and Development

The credit of finding the first lump of phosphate is usually given to Mr. Ralph Ewing, who was later associated with the organisation known as the Ewing Phosphate Co. Ltd., which was set up to exploit these deposits. An official record of the discovery and analyses of the various types of phosphate to be found at Clarendon was written up by the late Dr. Andrew in 1905 in Vol. 38 of the Transactions and Proceedings of the N.Z. Institute.

As far as can be ascertained the deposits were first worked in 1902, when the material extracted was ground and used in the raw state, principally for application to swede crops in the South Otago and Southland districts. In 1922 it sold at £3 15s. to £3 18s. 6d. per ton for 50 per cent. grade. Before and during the 1914-18 war the industry developed rapidly, and by 1922 over 150,000 tons of rock phosphate had been mined. In the meantime the Ewing Phosphate Co. Ltd. was formed, and a grinding plant, which had a potential output of 7,500 tons of phosphate per annum, was erected near the present Clarendon railway station. This building is still standing, and the name Ewing Phosphate Co. is still clearly discernible on it.

The conditions which favoured the development of the Clarendon deposits during the war of 1914-18 were essentially similar to the conditions which encouraged their re-opening during the present war. Principally these were a shortage of shipping for overseas supplies of phosphate coupled with high freight rates when shipping could be obtained.

Following the conclusion of the first Great War shipping became freely available and freight rates fell. This meant that adequate supplies of very high-grade phosphate could be brought into the Dominion from Nauru, Ocean, and Makatea Islands. For the most part the phosphate obtained from Clarendon was of a low to medium grade (50-60 per cent. tricalcic phosphate), and under the conditions which then obtained it was impossible for the Ewing Phosphate Co. to compete with overseas phosphate on an economic basis. The working of these deposits therefore ceased in the middle twenties.

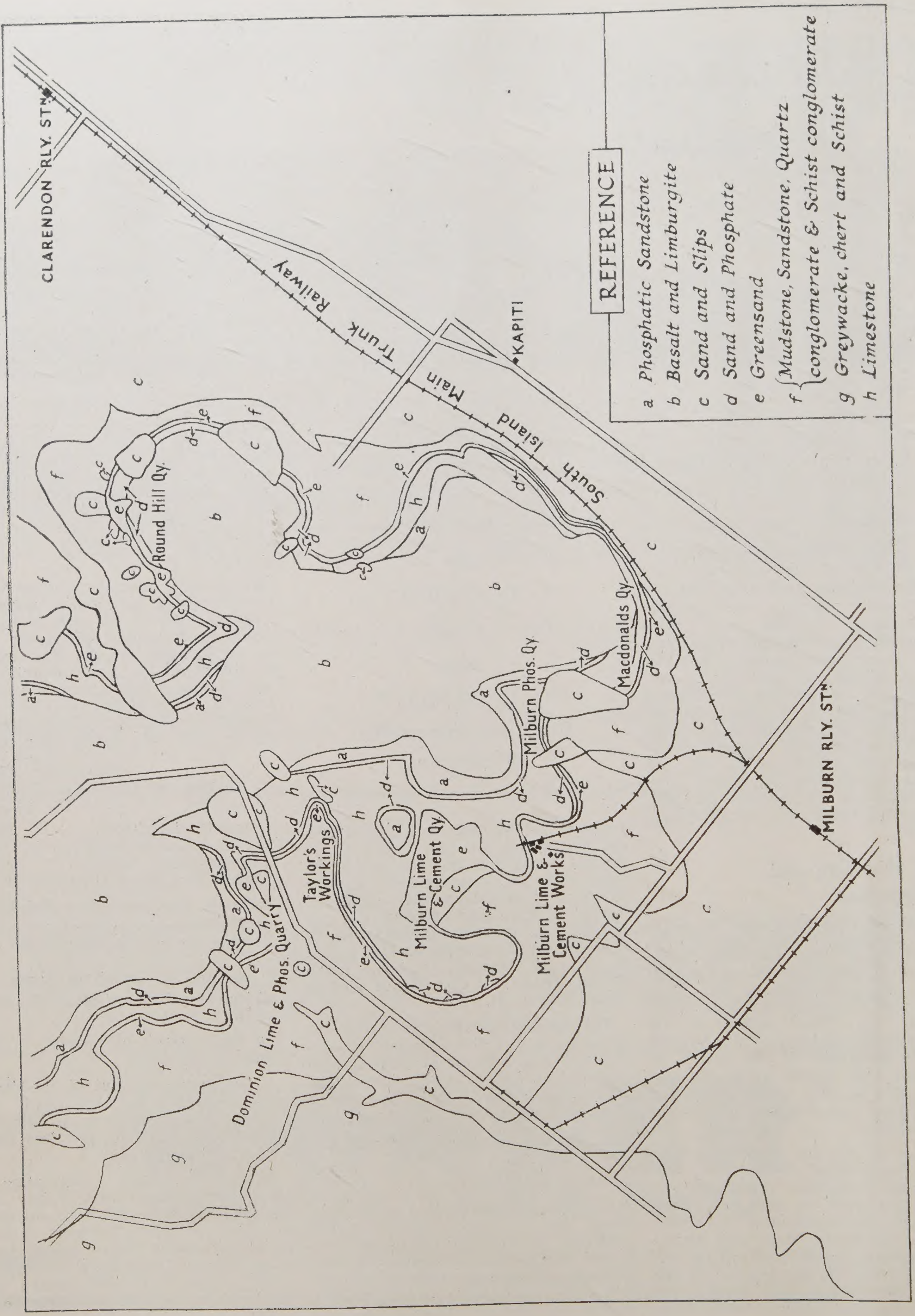
During the later part of its existence the Ewing Phosphate Co. did sell a certain amount of rock phosphate to Messrs. Kempthorne Prosser and Co. at Burnside for the manufacture of superphosphate, and the following extract from a letter from the works manager at Burnside to the works superintendent of Kempthorne Prosser and Co. Ltd. may be of interest.

> November, 1922.
>
> **Analysis of Clarendon Used:**
>
> | | Per cent. |
> |---|---|
> | Tricalcic phosphate .. .. | 52.00 |
> | Oxides of iron and aluminium | 4.87 |
> | Insol siliceous matter .. .. | 34.00 |
>
> Carbon dioxide—not determined.
>
> **Formula used for Super Making:**
>
> 100 Clarendon phosphate.
> 50 acid of 114 degrees Tw.
>
> **Analysis of Resultant Super:**
>
> Tricalcic phosphate total 39.2 per cent.

A later statement made in 1926 reads as follows:—

> The super cut out of the dens fairly well, but improved on standing. In the heap it became hard, but when bagged was fine and friable.

From the above information it therefore appeared that if any considerable amount of phosphate could be obtained from Clarendon, it could be manufactured with suitable treatment into a satisfactory superphosphate, provided it was mixed with sufficient high-grade rock from overseas.


CLARENDON RLY. STN.
KAPITI
South Island Main Trunk Railway
Round Hill Qy.
Macdonalds Qy.
Milburn Phos. Qy.
MILBURN RLY. STN.
Milburn Lime & Cement Works
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Taylor's Workings
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REFERENCE
a Phosphatic Sandstone
b Basalt and Limburgite
c Sand and Slips
d Sand and Phosphate
e Greensand
f Mudstone, Sandstone, Quartz conglomerate & Schist conglomerate
g Greywacke, chert and Schist
h Limestone

Recent Developments

During the early part of 1941 it began to become very obvious that New Zealand would obtain only a small part of her phosphate requirements from overseas, and rationing had to be introduced from July 1 of that year. Our difficulties were further aggravated by the entry of Japan into the war on December 7, 1941, and the subsequent cutting off of Nauru and Ocean Islands as a source of supply. From then on Clarendon again became seriously considered as a source from which phosphate could be obtained to supplement our meagre reserves.

The Geological Survey Division of the Department of Scientific and Industrial Research sent field geologists down to Clarendon to report on the position. In the meantime the Department of Agriculture, after consulting the British Phosphate Commissioners, suggested to the late Mr. Malcolm Stewart, then general manager of Kempthorne Prosser and Co., that he should enter into negotiations with the Milburn Lime Co., which had since taken over the property formerly owned by the Ewing Phosphate Co., with a view to re-opening the deposits. Subsequently, however, these developments fell through, and the Government requested the British Phosphate Commissioners to undertake the quarrying of the higher-grade Clarendon phosphate deposits.

Before things had developed thus far, however, a report was received from the Geological Survey Division indicating the possibility of there existing very large quantities of low-grade phosphatic sandstone containing some 10-12 per cent. phosphoric anhydride. Apparently this material had never been recognised as being phosphatic, and therefore of potential value, but it had been quarried and used in isolated cases as a building stone. For the sake of clarity, therefore, the further development of the Clarendon deposits will be considered under two heads, Clarendon phosphate being the name given to the higher-grade phosphate and Kapiti phosphate being that given to the relatively low-grade phosphatic sandstone.

Clarendon Phosphate

The immediate problem which arose in connection with the development of these deposits was one of the factors which had contributed to their unsuccessful working on an economic basis during the 1920's. They were of fairly low grade and very scattered in nature, involving costly stripping and much hand picking. In order to work the deposits on a more scientific basis than had been done before a drill and drilling team were obtained from the Mines Department. The drill was operated in the field under the general direction of Mr. Geo. Bridges, engineer for the British Phosphate Commissioners, and under his guidance most of the likely areas were bored.

The first area to be drilled and ultimately worked was an area just north of that shown on the map as the Round Hill Quarries. Here a cut was put in to the hill named by Mr. Bridges the North Slope Quarry, and from this cut some 3,000-4,000 tons of rock were extracted. When the overburden became too high in proportion to the quantity of rock which could be quarried a further cut was made almost at right angles to the first and joining up the North Slope Quarry with what were named Stewart's Canyons after the late Malcolm Stewart, of Kempthorne's. This cut was called New Cut and yielded about the same quantity of rock as the North Slope Quarry.

The first delivery of Clarendon phosphate to superphosphate works was made in February, 1943, during which month 119 tons were delivered. In all 7,489 tons were sent to fertiliser works from the workings of the British Phosphate Commissioners, and on the completion of delivery in May, 1944, further work on the deposits ceased.

As has already been stated the deposits were extremely scattered and variable in nature, and although all likely areas were carefully drilled, no further deposits of sufficient size and easy access were discovered. This was the reason why it was agreed between the Department of Agriculture and the British Phosphate Commissioners that work should cease in May, 1944.

Kapiti Phosphate

Kapiti phosphate was the name given to the low-grade phosphatic sandstone deposits for the reason that the first quarry to be opened was in a locality marked on the early lithographs as Kapiti, and also so that no confusion would arise between the Clarendon rock, which has already been referred to, and the product of this other quarry.

Reference has already been made to a report from the Geological Survey Division of the Department of Scientific and Industrial Research in which it was suggested that there may be a considerable tonnage of phosphatic sandstone averaging 10-12 per cent. of P_2O_5. This was quite a new discovery, and the credit for making it must go to Mr. E. O. Macpherson, of the Geological Survey Division.

The Kapiti phosphate, as it later became named, existed at a higher level than the Clarendon phosphate, and outcrops of this material were to be found in scattered localities right round the whole of the Clarendon Hill and also on Waihola Hill, some four or five miles to the north. From the superficial evidence alone it seemed only reasonable to assume that very large quantities of this

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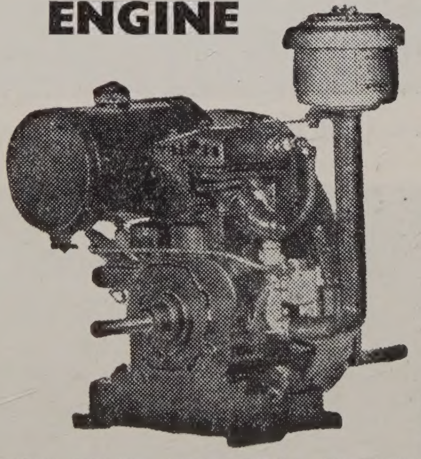

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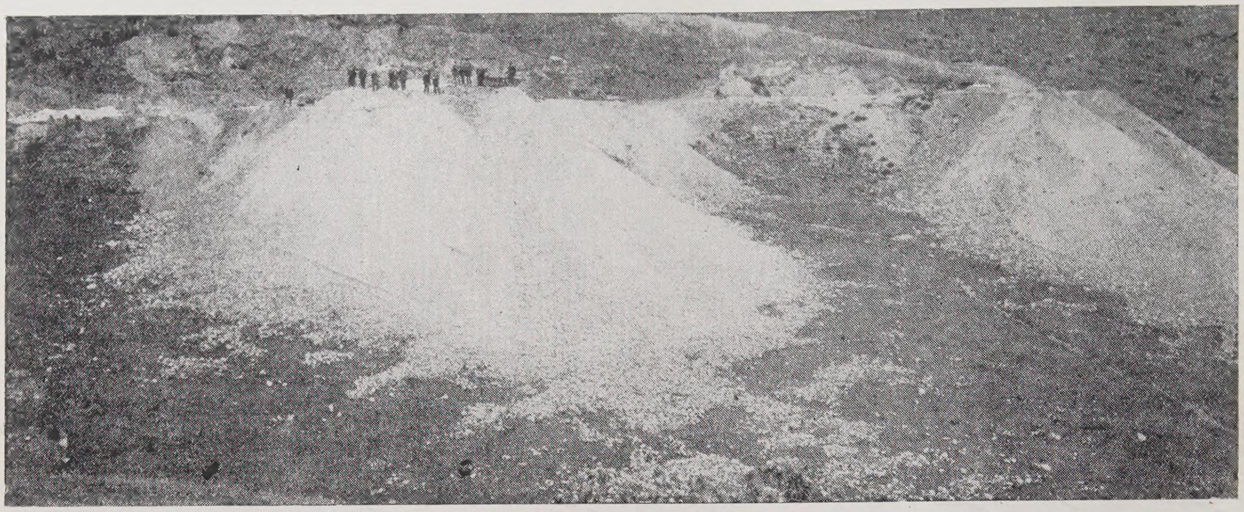
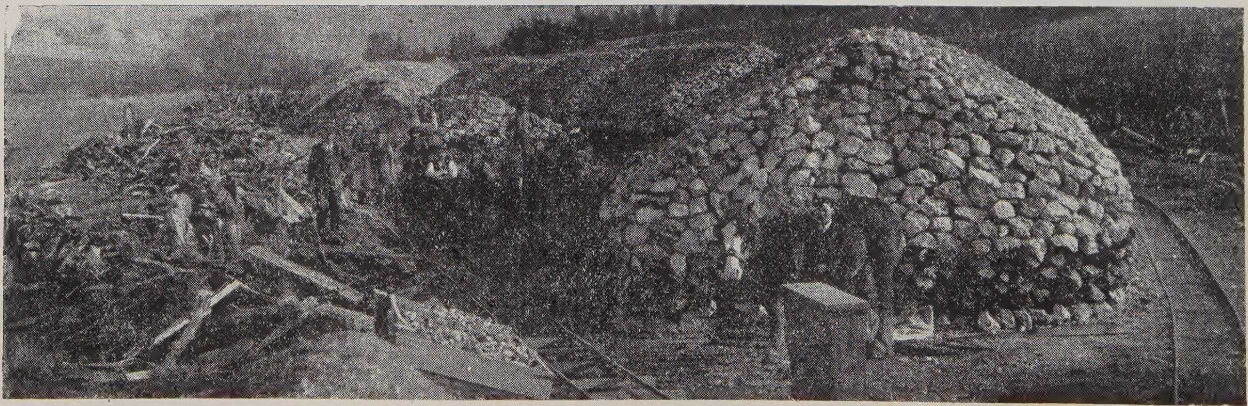
EARLY WORKINGS AT CLARENDON



Heaps of discarded material from the old workings.

Entrance to a shaft where rock phosphate was once mined.



A heap of stone piled on logs ready for drying.

material existed. It also appeared as if the Kapiti rock might "live" as a solid layer right through the hill, in which instance an enormous tonnage of material would be available for working. It was, however, at all times made clear that the existence of these large tonnages was largely a matter of conjecture, and that the only way in which any finality on the question could be obtained was by instituting a comprehensive drilling programme. This was immediately proceeded with. Unfortunately, however, it appeared from the drillings that the rock "lived" only in isolated areas, and was not one solid mass. This, of course, made necessary a complete revisal of the methods by which the deposits might be worked.

However, in the first area drilled, that at Kapiti itself, quite a fair tonnage of material—estimated to be about 30,000 tons—was discovered, and it was decided to proceed immediately with the quarrying of this material and its processing in a manner which would make it useful to the farming community. Accordingly a contract for quarrying and processing, supervised by the Public Works Department, was let to Messrs. Fulton Hogan and Co. Ltd., of Dunedin, and work was commenced early in 1943.

In the meantime the drilling of the area was proceeding, and samples of rock were sent to the School of Mines at Thames with a view to seeing whether or not the material could be enriched by the process known as flotation. This became particularly important with the discovery that associated with the sandstone was a very large body of loose sand, which was also phosphatic. The report from the School of Mines showed that the Kapiti rock could be raised considerably in grade, but that economic working would involve handling large quantities of material. It was indeed unfortunate that the results of drilling conducted by the Mines Department failed to show a sufficient bulk of material to warrant the installation of the necessary plant to carry out this process of enrichment. In general, too, the results from trials to concentrate the phosphate from the loose sands proved disappointing.

It therefore appeared that under present circumstances anyway the best method of working the deposits was to proceed with the arrangements made with Messrs. Fulton Hogan. This was done and up to about the end of 1944 just over 20,000 tons of Kapiti rock have been quarried and sent out to the farms of South Otago and Southland.

At the present time it looks as if only a few months will elapse before operations from the present quarry will stop. The possibility of opening up further areas is under consideration, but it is thought that no other site will be so favourable for quarrying operations as that already operated at Kapiti, and it may be necessary to close down the enterprise entirely.

TRIALS WITH KAPITI PHOSPHATE

The discovery of this low-grade phosphate in a situation from which supplies could be transported easily to Otago and Southland centres necessitated an investigation into its value on both crops and pastures in these districts. Consequently in November, 1942, a number of field trials were laid down on crops of turnips, swedes, and rape, and this phosphate was also applied as a topdressing on pastures. To supply approximately the same amount of phosphate Kapiti phosphate was applied at twice the rate of the fertiliser employed by the co-operating farmer.

TABLE I—CROP TRIALS: KAPITI PHOSPHATE AND REVERTED SUPERPHOSPHATE.

As it was not possible to carry out the usual type of replicated experiment, statistical examination of results was possible in only a few cases. Most trials consisted either of alternate pairs or single ridges sown with Kapiti and others with reverted superphosphate as part of the farmer's crop. In this series the higher solubility of the reverted superphosphate would be expected to be reflected in earlier growth, and its general value with all brassica crops is well known. In the following table yield data are shown in detail:—

TABLE I

Place.	Crop.	Rate of fertiliser application and yield per acre.				Difference. Tons per ac.
		Kapiti.		Reverted Super.		
		Rate.	Yield.	Rate.	Yield.	
Season 1942-43:		cwt.	tons.	cwt.	tons.	
Outram ..	Swedes	2	29.1	1	34.4	— 5.3
Outram ..	"	4	28.1	2	32.2	— 4.1
Winton ..	"	4	44.6	2	50.4	— 5.8
Thornbury ..	"	3⅓	40.9	3	41.6	— 0.7
Benio ..	Soft turnips	4	18.4	2	16.3	+ 2.1
Season 1943-44:						
Te Houka ..	Swedes	6	18.2	3	20.7	— 2.5
Winton ..	"	6½	28.6	3	26.9	+ 1.7
Edendale ..	"	6	30.3	3	37.4	— 7.1
Edendale ..	"	4	13.4	1¾	19.6	— 6.2

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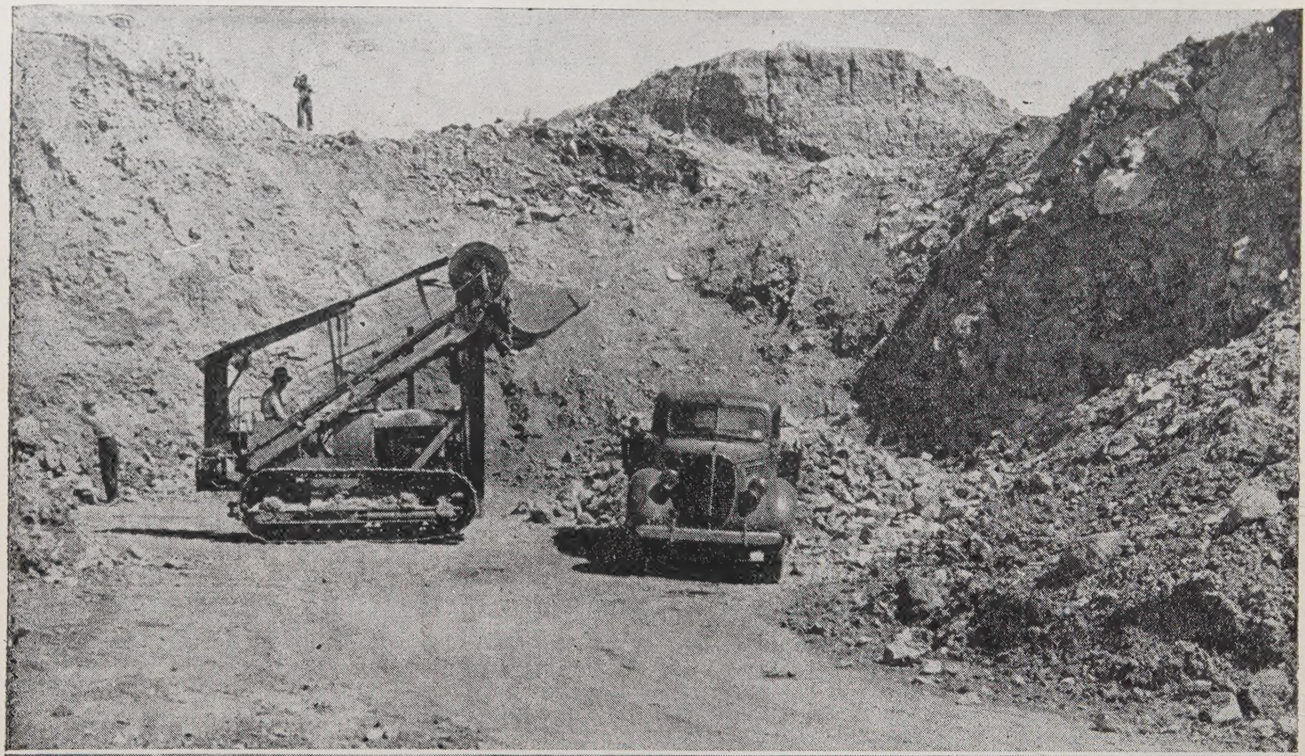

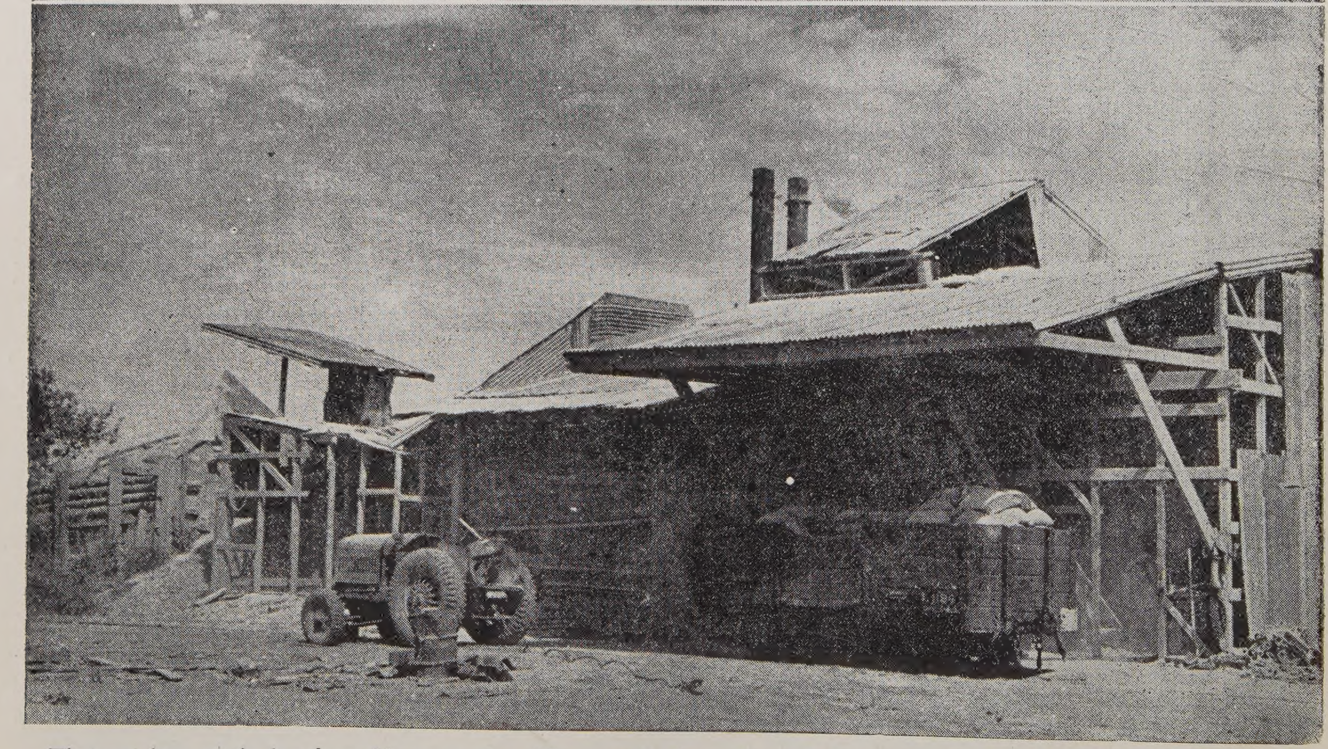

That modern methods of working quarries differ greatly from those of 40 years ago is clearly shown by comparing the upper picture with those on page 454. In the old workings the whole of the excavation and earth shifting was done by pick and shovel and barrow. With a front-end loader and lorry spalls can be quickly cleared from the quarry face. The lower picture shows the temporary plant installed by Messrs. Fulton Hogan at the Milburn railway station for processing Kapiti phosphate.

TABLE II—CROP TRIALS KAPITI PHOSPHATE AND PROPRIETARY AND SPECIAL MIXTURES.

The layout of these trials was similar to that in those described above. The proprietary mixtures usually contain reverted superphosphate and blood and bone, and the combination of nitrogen with soluble and insoluble phosphate provides a wider range of plant nutrients than does Kapiti phosphate. The special mixtures consisted of superphosphate plus reverted superphosphate, each of these plus lime and in one case borated superphosphate.

TABLE II

Place.	Crop.	Rate of fertiliser application and yield per acre. Kapiti. Rate. cwt.	Kapiti. Yield. tons.	Proprietary Rate. cwt.	Proprietary Yield. tons.	Difference. Tons per ac.
Season 1942-43:						
Thornbury ..	Swedes	3⅓	40.9	4	40.1	+ 0.8
Mandeville ..	"	5	30.4	5½	30.2	+ 0.2
Benio ..	"	4	15.9	4	20.5	— 4.6
Waimumu ..	Yellow-fleshed turnips	3½	26.9	2½	28.1	— 1.2
Waimumu ..	"	5	25.2	2½	28.1	— 2.9
Waimumu ..	"	7	27.5	2½	28.1	— 1.6
Dacre ..	Soft turnips	3	12.6	3	14.8	— 2.2
Dacre ..	"	6	14.8	3	14.8	Nil.
Season 1943-44:						
Waimumu ..	Yellow-fleshed turnips	5	20.0	2½	22.5	— 2.5
Edendale ..	Swedes	6½	26.6	3	26.9	— 0.3
Pyramid ..	Yellow-fleshed turnips	8	24.9	3¼	26.9	— 2.0

In addition, in the 1942-43 season 5 trials with swedes and 2 with rape were sown in the Balclutha district. In each trial Kapiti was applied at twice the rate of the other fertiliser, and, while no yield figures were secured, no differences were observed between treatments.

TABLE III—PASTURE TRIALS: KAPITI PHOSPHATE AND REVERTED SUPERPHOSPHATE 1942-43 SEASON:

Topdressing trials were not replicated, but consisted of portions of a field on which Kapiti and the other fertiliser were applied either on adjoining blocks or on areas separated by an untopdressed strip. Details secured from 2 yield trials and 6 observational trials are as follows:—

TABLE III

Yield trials: Place.	Kapiti Rate. cwt.	Weight Green material. tons.	Reverted superphosphate. Rate. cwt.	Reverted superphosphate. Weight green tons. material.	Difference. tons per acre.
Waimumu	4	7.7	2	7.5	+ 0.2
Benio	4	4.4	2	4.3	+ 0.1

DELAYS are DANGEROUS
EFFECT That POLICY
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GOVERNMENT LIFE
TO-DAY

No differences were observed between treatments in either trial.

Observational Trials

Winton (1): No obvious differences in hay yields between areas topdressed with Kapiti 3cwt. and superphosphate 1cwt. per acre.

Winton (2): No differences observed between Kapiti 4cwt. and reverted superphosphate 2cwt. per acre.

Thornbury and Mandeville: As for Winton (2) above.

Dipton: Kapiti 3cwt. equal with superphosphate 1cwt. per acre. When closed for a ryegrass seed crop clover was more dense on the Kapiti area.

Edendale: No obvious differences between Kapiti 7½cwt. plus lime 1 ton and superphosphate 1¾cwt. plus lime 1 ton per acre.

Summary

1. Kapiti phosphate is a finely-ground, low-grade rock phosphate obtained from a deposit in the Clarendon district in South Otago. It has a P_2O_5 content of from 10 to 12 per cent.
2. Trials with root crops (turnips and swedes) carried out during the years 1942 to 1944 indicate that Kapiti phosphate applied at twice the rate of fertilisers commonly used has given payable yields in the Otago and Southland districts.
3. Two trials on pasture in the 1942-43 season where Kapiti phosphate was again used at double the normal rate and where green weights of the hay crop were recorded indicated that this fertiliser gave satisfactory results.

On 6 observational trials there appeared to be no difference in response between areas topdressed with Kapiti phosphate at twice the rate of the other fertiliser with which it was compared.

Telling Age of Cattle From Their Teeth

It is possible to tell the approximate age of cattle up to four years by their teeth as follows:—

All four temporary incisors on each side of lower jaw have erupted at birth or soon afterwards.

At 1 year 9 months the permanent central incisors erupt.

At 2 years 3 months the permanent lateral central incisors erupt.

At 2 years 9 months the permanent lateral incisors erupt.

At 3 years 3 months the permanent corner incisors erupt.

Although specific ages are given at which the teeth normally appear, variations from the normal are not infrequent. Thus, in station-bred or late-maturing cattle the teeth may be three months late in appearing, whereas in specially-bred cattle produced and prepared for show purposes the teeth may appear three months earlier than the ages stated. Three months normally elapse from eruption of the teeth until they are in full wear.

Dentition of Cattle

The eight temporary incisor teeth of cattle are present at birth or soon afterwards. At the same time the young calf is provided with three temporary molar teeth in each side of the jaw, above and below. These three molar teeth are described as 1st, 2nd, and 3rd molars.

In the course of time all of these temporary teeth are replaced by permanent teeth, and at the same time three additional molar teeth of a permanent type are added. These three are known as the 4th, 5th, and 6th molars.

The 4th molar tooth, on each side of the jaw, appears as a permanent tooth at 6 months of age. The 5th molar tooth, also a permanent one, is cut at 15 months of age.

At 2 years of age the central incisor teeth have been replaced by two permanent teeth of a stronger and broader type. At this age the 6th molar tooth is also cut.

At two and a half years of age the next pair of incisor teeth are usually up, as well as the 1st and 2nd permanent molars.

At 3 years of age another pair of incisor teeth, known as laterals, are up, and usually in full wear, and the 3rd permanent molar is up.

At three and a half years of age the last pair of incisor teeth, known as corner broad teeth, are usually up and in full wear. These latter two teeth are more erratic than others in their time of appearance.

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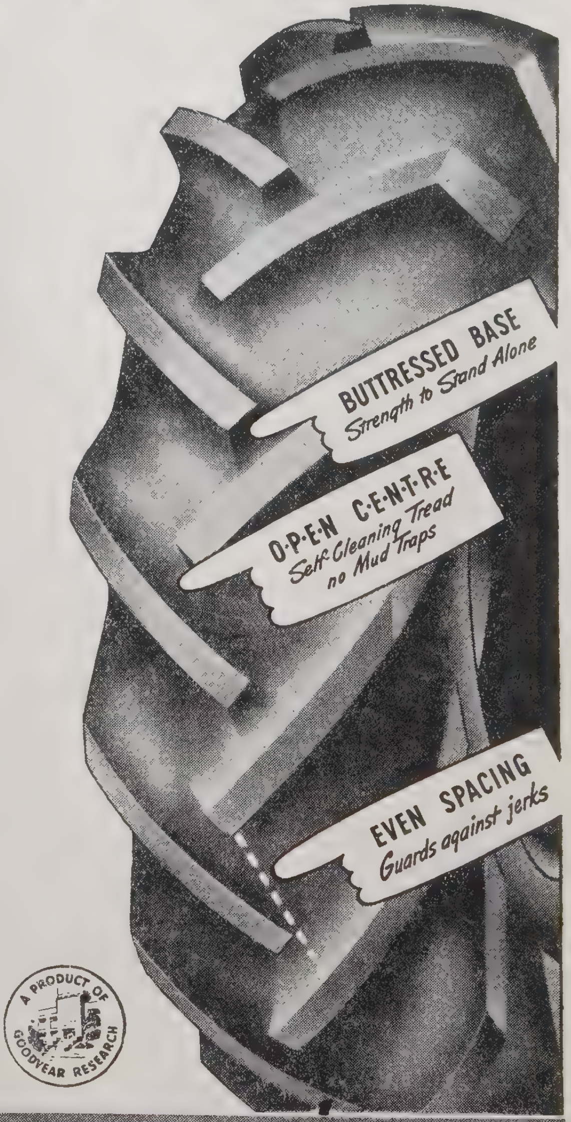
Every farmer knows that from experience.

If your tractor tyre tread has pockets that "gum up" with mud and dirt, the tyre's bound to slip and spin. And that means less pull, wasted fuel and more time spent in working every furrow.

So just get an eyeful of the great Goodyear Sure-Grip tyre with its time-proved, *self-cleaning* O-P-E-N C-E-N-T-R-E tread, pictured here. Note those wide, deep channels, open at *both* ends to let dirt slide out. There are no mud traps there—no dead-end pockets to snag on roots and stones.

Note, too, that those husky lug bars are extra wide at the base for strength to stand alone. That means deeper bite. And they're even spaced for smooth, steady pulling and smooth rolling.

There's your answer to the "gum-up" problem. We know because we've tested Sure-Grips on our experimental farm, *proved* they top other makes in pulling power, in every type of soil—on cover crops, too. So, remember, for prime working efficiency, fuel economy and long life, your best bet is Goodyear Sure-Grip—the tyre with the *self-cleaning* O-P-E-N C-E-N-T-R-E tread.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FARMING IN NEW ZEALAND

Transport

EFFICIENT transport is vital to the progress of New Zealand farming. This article describes the development of transport from the period of early settlement to the present day—from bullock teams and horse-drawn coaches to modern rail and motor transport—and traces the influence of improved transportation methods on farming.

By
MARY AITKEN,
Rural Development
Division, Christchurch.

THE function of the New Zealand transport system is to link together the country's scattered communities and isolated centres of population, which depend largely on an effective transport system to give them a sense of economic unity with the rest of the country. The surface configuration of the country has made such a linking up difficult, the rugged nature of much of New Zealand often creating road-making problems for the engineer. Many miles of road have been built over hilly and mountainous country, and the irregular nature of the land surface has necessitated the building of a large number of bridges and tunnels. Bridges may be over deep, gorge-like watercourses, or over wide, meandering streams. The effect of topography on the road and railway system is most apparent, the network pattern of road and rail being densest and most regular on the flat plains of the country. On steeper and more broken surfaces roads are few and irregular in their distribution.

The high mountain ranges have formed a natural barrier between eastern and western regions. The mountain belt has been crossed by only one rail route in either island (in the north the Manawatu Gorge route connects the lowland of Hawke's Bay with the Manawatu-Rangitikei lowland; in the south the rail link between east and west coasts is via Otira). The absence of natural harbours has also made coastal communication between east and west difficult. Where towns have been built on the open coast, e.g., Gisborne, Greymouth, Timaru, and Oamaru, artificial harbours have been erected at considerable cost. With the extension of railway building and improved road transport, the trade of such ports has declined. The tendency of recent years has been to rail the produce that normally went to such centres to the chief ports for export overseas. Thus a system of main ports and subsidiary ports has developed, the latter declining in importance.

The lines of sea transport that exist between the North and South Islands and other outlying islands, e.g., the Chatham Islands, form a vital link in the communications of the country. Water transport is also important in marketing agricultural produce in districts which are not served by roads. Such areas occur in North Auckland, the Marlborough Sounds, and the southern lakes of Otago. In areas where the straight-line distance to markets is short and the intervening country broken in character water transport competes with road services.

The development of agriculture in New Zealand has been closely linked to advances in transport and communication. Within the last few years the quicker interchange of goods between town and country has become increasingly important. Greater mobility of the rural population is of economic and social significance.

The following figures give some indication of the milage of roads and the number of bridges in rural districts at the present time.

TABLE LXVII—Milage of roads in Counties (excluding Boroughs, Town Districts, and Road Districts), 1943.

	Miles.
Bituminous or concrete-surfaced roads	3,548¼
Metal or gravel	36,652¼
Roads not paved or surfaced	8,838
Total formed roads	49,038½
Bridle tracks	5,723¾
Unformed legal roads	16,838¾
Total all roads	71,601

TABLE LXVIII—Number and Length of Bridges (over 25ft. in length) in Counties, 1943.

	No.	Total Length. ft.
All concrete or stone ..	819	73,711
Steel and concrete ..	602	58,626
Steel, concrete, and timber	439	44,285
Steel and timber	710	53,218
Australian hardwood ..	1.926	199,015
Native timbers	2,363	162,848
Total	6,859	591,703

In addition to the roads and bridges mentioned above, there are 3,390 miles of railway. Of this milage the greater length (1,756 miles) is in the South Island. The road system of the present day has developed gradually, and has not always been designed for modern motor traffic. Some of the roads still follow the original routes formed by the bullock wagons and horse teams of the early settlers.

First Settlers' Difficulties

In the first stage of settlement isolated groups of people were linked to one another by tracks cut through dense bush. Sometimes, however, it was quicker to travel by sea in whaleboats, as the tracks through the bush were difficult to traverse. Early explorations and surveys were carried out on foot, and supplies were restricted, as they had to be carried on

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[The photograph used in the heading is from the "Auckland Weekly News."]

PROGRESS OF TRANSPORT

In the early days of colonisation isolated groups of settlers were linked by rough tracks cut through the bush and scrub: sailing ships carried goods between the scattered coastal settlements and main ports. Bullocks were used to transport goods and to do the carting and cultivation work on farms. The photograph on the right is from the "Auckland Weekly News."

Later quicker-moving horse teams and coaches took the place of the slower-moving bullock wagons and drays. The number of horses in the Dominion increased from 3,000 in 1851 to 400,000 in 1911, since when they have decreased to 260,000 as rail and motor transport have become increasingly important. As roads and bridges were improved, steam traction engines were used for driving threshing mills and for hauling heavy loads of grain and wool. The photograph on the left is from the "Auckland Weekly News."

The first railway line in the Dominion was opened in 1863: there are now 3,400 miles of line open for traffic, and the railways are the basis of the Dominion's transport system. Motor transport became increasingly important in the inter-war period, and from the passing of the Main Highways Act, 1922, the improvement of the main roads to cater for motor transport has been most marked. Improved road, rail, and sea transport have been very important factors in developing the Dominion's farming industries.

Pack-horses: Wool has still to be carried by pack-horses from isolated inland stations.
"Auckland Weekly News" photo.

the backs of the travellers and their guides. Often the early settlers found only pegs and string to mark the position of the main streets in the towns they had come to build. For several years these streets were almost impassable in winter. An early writer says that it was quite common in the middle of winter for pedestrians to get bogged on the streets. In some cases tracks from settlement to settlement were even unfit for horseback riding, and often journeys had to be completed in several stages. Perhaps after starting out by horse and buggy only horses could proceed, and finally horses would have to be abandoned and the traveller proceed to his destination on foot. As the settlements progressed the arrival of bullocks and drays helped to solve transport difficulties. As roads improved heavy carts were introduced, and later lighter transport such as buggies and coaches appeared.

Losses in Moving Stock

In the early days all transport of stock was on the hoof, and it often took a runholder several weeks to reach his holding with his newly-acquired flocks. It was not possible to move sheep through new country at a rate much over 10 miles per day. In settlements where there were no wharves or landing places attempts were sometimes made to swim the sheep ashore through the surf, which usually meant the loss of large numbers. Many sheep and cattle were also lost when they were forced to swim rivers. Care had to be taken in finding a suitable ford to swim the animals across, the best place being above a point where the river branched into two. Here there was usually a calm and shallow stretch of water, while below the stream broke into rapids and deeper water. On meandering watercourses it was comparatively easy to find such places. Along swifter and straighter streams shepherds might have to travel many miles before finding a suitable crossing place. If boats were available, some of the stock were towed across by ropes to encourage the rest to follow. If these had been pastured for any length of time on the far bank of the river, the drovers might awake to find their entire flock had returned in that direction during the night.

When boats became more plentiful they were kept at recognised crossing places on the larger rivers and used for the transport of people and stock. If there were no boats, horses were used to pull the stock across. Many men also lost their lives when attempting to swim streams in flood, both riders and horses being swept away in the strong currents. When the gold rushes occurred and opened up the southern interior areas the climatic severity of the back country was not realised. Its bitter and rough winters made travelling difficult, and many miners lost their lives in attempting to cross the snow-covered ranges. The absence of trees and the consequent lack of shelter also caused deaths.

Bullock Teams

Bullocks were early imported into this country from Australia and England. A good bullock team was a valued possession. The owner of such a team was not dependent on the few roads there were. In the hands of a skilled driver bullocks could travel far and wide across the country. The chief drawback was that fully-loaded teams travelled very slowly. If they had not been yarded the previous night, which was not always possible when travelling across the open country of the plains, much time was also lost in rounding them up. During the gold rushes in Otago bullock teams were widely used to cart supplies to the goldfields, and for the laborious journeys to the summits of the ranges to cut peat. This peat was brought down and burnt in the small towns in the adjacent valleys. Bullocks were used in carting logs in the bush clearings of the North Island. In both islands run-holders carted goods and supplies to their stations by these teams. Bullocks were harnessed to

NEW ZEALAND

Showing Ports & Railways

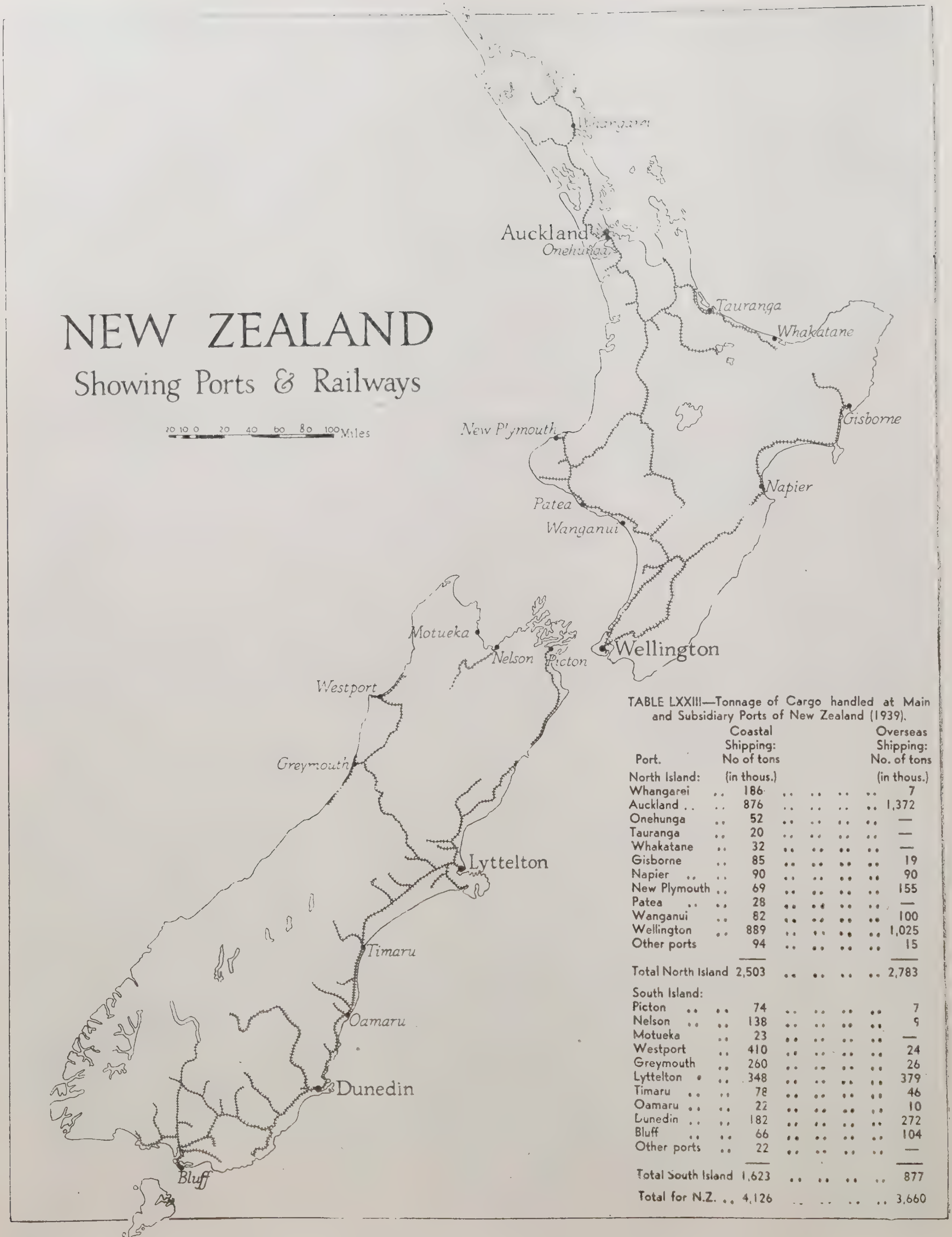

20 10 0 20 40 60 80 100 Miles
Whangarei
Auckland
Onehunga
Tauranga
Whakatane
Gisborne
New Plymouth
Napier
Patea
Wanganui
Wellington
Motueka
Nelson
Picton
Westport
Greymouth
Lyttelton
Timaru
Oamaru
Dunedin
Bluff

TABLE LXXIII—Tonnage of Cargo handled at Main and Subsidiary Ports of New Zealand (1939).

Port.	Coastal Shipping: No of tons (in thous.)	Overseas Shipping: No. of tons (in thous.)
North Island:		
Whangarei ..	186	7
Auckland	876	1,372
Onehunga ..	52	—
Tauranga ..	20	—
Whakatane ..	32	—
Gisborne ..	85	19
Napier	90	90
New Plymouth ..	69	155
Patea	28	—
Wanganui ..	82	100
Wellington ..	889	1,025
Other ports	94	15
Total North Island	2,503	2,783
South Island:		
Picton	74	7
Nelson	138	9
Motueka ..	23	—
Westport ..	410	24
Greymouth ..	260	26
Lyttelton ..	348	379
Timaru	78	46
Oamaru	22	10
Dunedin	182	272
Bluff	66	104
Other ports ..	22	—
Total South Island	1,623	877
Total for N.Z. ..	4,126	3,660

both wagons and drays, drays being preferred when the country was rough and the grade steeper. With drays smaller loads were carried and they could also turn in a smaller space than the heavy wagons.

Horses and Coaches

Later quicker-moving horse teams and coaches largely took the place of the slow-moving bullock wagons and drays. Horse teams and heavy drays and wagons were used to cart supplies between settlements.

An improvement in passenger service took place with the introduction of regulated coach traffic by Cobb and Co. In its day the coach service was recognised as most efficient and as a great improvement over previous methods of transport. When railways were built coach services were run in conjunction with the railway. One of the first coach trips accomplished the journey to Gabriel's Gully from Dunedin in a day, whereas before it had taken a two days' journey on horseback. The coaching system meant a large increase in the number of horses in the colony, as many were required to provide relays. The number of horses kept for farm work also increased as improved machinery appeared on the market. Sheds for implements and large stables and harness rooms were a conspicuous feature of farm buildings.

TABLE LXIX—Number of Horses.

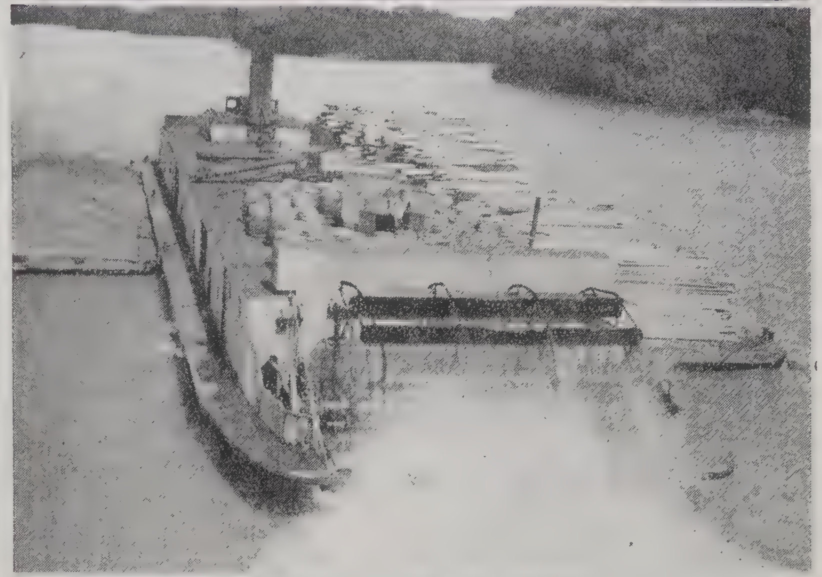
1851	2,900
1861	28,300
1871	81,000
1881	161,700
1891	211,000
1901	266,200
1911	404,300
1921	337,300
1931	295,700
1941	266,100

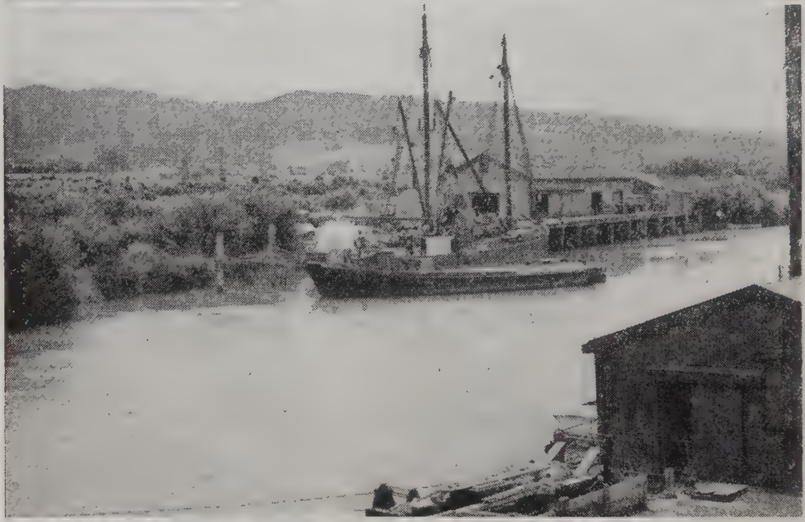
(The recent decline in the total number of horses is largely due to the increased numbers of motor-cars, motor lorries, and farm tractors).

Traction Engines

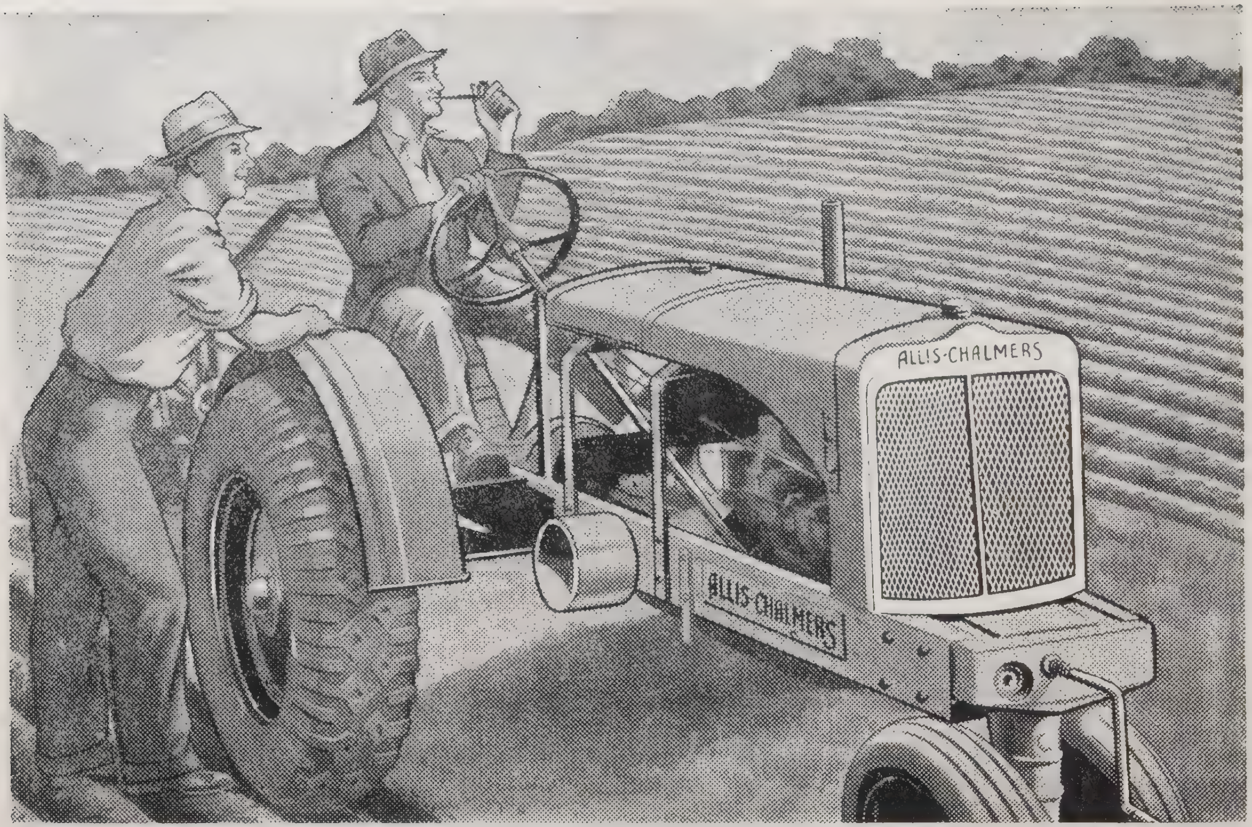
With further improvements in roading and the building of bridges in the late eighties, traction engines were used for hauling heavy loads. Formerly they were restricted in their use, as strong bridges were necessary to stand their weight. With the bridging of the Waitaki River at Kurow, traction engines were used to transport wool to the railhead from the Mackenzie Country. They were widely used on the flat roads of both islands to carry grain and wool, and frequently hauled loads of 150 bales of wool, heavier engines sometimes pulling as many as 9 wagons, each with 30 bales. The chief merit of the traction engine was that it could move a large amount of farm produce in

WATER TRANSPORT





[Photographs on this page are from the "Auckland Weekly News."]



"Son, this Allis Chalmers certainly __has__ made the grade!"

"—seven years old already, but the way it gets through the work on the farm, you'd think it almost brand new!"

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Occasionally, even a sturdy veteran like Allis-Chalmers may need a servicing job that is beyond your own powers.

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one load and at a quicker rate than horse teams.

Exports Surfed to Ships

Before railways connected the chief centres wool and grain were often brought down to the nearest coastal towns for export overseas. There were various methods of transferring this produce from shore to ship. Before the building of breakwaters it was packed on large surf boats and taken out to overseas ships standing offshore. Sometimes boats were rowed out or were hauled out by horses or bullocks. At Timaru there was an elaborate system of surfers in use. At many of these towns on the open coasts roadsteads were exposed and there was no shelter for overseas ships, so that wrecks were not uncommon. When rail connections were established, however, agricultural produce was railed to the main ports for transhipment overseas.

First Railroads

Once it was seen that New Zealand was a land of vast agricultural resources, it was soon realised that the growth of a railway system was important. Lines were built to exploit agricultural, forest, and mineral wealth. The railways gave the farmers quick access to harbours. After the introduction of refrigeration the quick transport of stock to the freezer was necessary. In 1863 the first stretch of line, that between Heathcote and Christchurch, was opened. After this progress was slow until Vogel's programme speeded up the construction of public works. The result was that the South Island was well served with railways, main lines and branch lines being built. This network was especially well developed on the plains of Canterbury, Southland, and Otago.

Road and rail development came later in the North Island than it did in the South. In the North there was first the task of clearing the bush before either roads or railways could be built. In the winter months the roads were practically impassable, and heavily-laden drays could not be hauled over them. This led, in the North Island especially, to the building of wooden tramways. These were often over 20 miles long. The horse-drawn wagons afforded cheap transport for agricultural goods and timber. As these lines were usually built to exploit timber country, they allowed settlers in the more distant districts a quicker and cheaper means of transport. On account of the heavy rainfall, a great number of drains and culverts had to be constructed. In parts of the North Island the cost of metalling roads was a big item. In these parts there were no such large deposits of river gravel as there were on the plains of the South Island. Variety of geological outcrops within short distances meant that cuttings had to be constructed in accordance with the materials encountered. The North Island main trunk line was not completed till 1908. In passing through the central portion of the island it opened up densely-bushed country. In these areas the railway was the pioneer and the settler followed later to open up the country. Large areas were cleared of bush and were used to graze sheep. Today this country is still an important sheep-grazing district. Recently, however, dairying and market gardening have developed, as at Ohakune. Within the past few years many building projects which had been visualised earlier were completed or are nearing completion. These are the Napier-Gisborne and Westport-Nelson railways, and the Picton-Blenheim-Christchurch line, which will complete the main east coast line of the South Island. The increase in the number of miles open for traffic is shown in the following table:—

TABLE LXX—Railways.

	No. of miles open for traffic.
1881	1,300
1891	1,800
1901	2,200
1911	2,800
1921	3,000
1931	3,300
1941	3,400

Roading Improvement

The introduction of motor transport brought improvements in roading. This has been especially marked during the last 20 years.

TABLE LXXI—Milage of Formed Roads and Number of Bridges (over 25ft. in length) in Counties.

	Total milage formed roads. (approx. only)*	Number of bridges.
1921	36,642	—
1926	40,868	4,118
1931	43,996	5,268
1936	46,880	5,995
1941	49,038	6,859

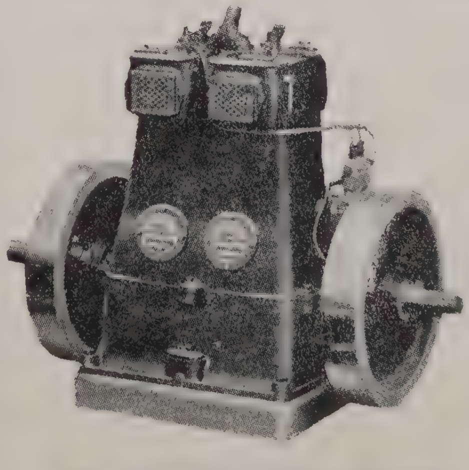
*This figure is only approximate, as 85 per cent. of the local bodies were unable to give accurate lengths.

The number of motor vehicles of all types has increased rapidly.

TABLE LXXII—Motor Cars and Trucks.

	Motor cars.	Trucks (light and heavy).
1921	—	—
1926	92,813	15,885
1931	153,265	34,797
1936	152,475	42,390
1941	215,516	48,477

Before the advent of the motor-car nearly all traffic on the roads had been local traffic. Strong local organisations were responsible for the upkeep of roads. On the abolition of the old Provincial Councils, County Councils kept up the roads within the county boundaries. With the greater use of the lorry and motor-car local roads were used by vehicles which did not contribute to their upkeep. Roads in one county might be of importance to the inhabitants of an adjoining county, who paid nothing towards their upkeep. The passing of the Main Highways Act in 1922 set up boards which assumed control of the main arterial roads of the country. The control of roads by these boards meant that the main roads were maintained at a uniform standard throughout the country. Even in counties which did not raise large sums in



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rates the uniform formation of highways did not deteriorate. County Councils were still responsible for the upkeep of secondary roads within their boundaries. They also contributed to the costs of main highways. Flood damage and river control work is usually subsidised by the Government. In 1923 the board took over control of 6,000 miles of roads, and today it has some 12,000 miles under its administration.

Motor Transport

The introduction of motor transport and improvement in roads have gradually led to a great reduction in the number of horse teams. When the motor-car first appeared the possibilities it offered of transporting goods were not generally realised; it seemed to be regarded only as a means of transport for passengers. In 1915 the "Otago Witness" printed an illustration entitled "A novel method of delivering straw; 21 tons carried by car from Otago farm." Since then motor transport has become a recognised method of carrying many farm products.

Improvements in transport resulted in settlements being made at greater distances from the railway. In some isolated hill-country farming districts adequate roading was not carried out immediately. It was soon found, however, that good roads were necessary to the success of land settlement schemes. Changes in land utilisation were also brought about by advances in transport. Land which formerly lay beyond the margin of fat stock production was now able to supply the central markets. Oats and wheat for local consumption were no longer grown in districts in which their cultivation was difficult. The easier transport of grain made it possible to raise these crops in areas where climatic conditions were most favourable for their growth, i.e., the east coast of the South Island.

Improved transport has had an important effect on the dairying industry. Before quick means of transport were available all milk was taken to creameries, which, owing to limitations imposed by horse transport, were numerous and were situated in districts where they were readily accessible to suppliers. At creameries milk was separated and the cream sent to factories to be made into butter, while the skim-milk was taken back to the farm. With the introduction of home separation, cream only was transported. This was a less bulky commodity than whole milk, so that the radius of direct supply to factories was extended. With the coming of motor transport the supply area extended still further away from the butter factories. Thus the smaller factories tended to amalgamate into larger units. This was due partly to improved transport

PRODUCTION TARGETS

1945-46

LINEN FLAX

The war effort of South Island farmers in producing linen flax under adverse conditions has received unstinted praise from overseas visitors. But the need for linen flax is still great. 20,000 acres are required for 1945-46 and farmers in the recognised linen flax areas should put aside as much ground as possible for this priority crop and make a start on the recognised methods of land preparation.

BUTTERFAT

The 190,000 tons of butterfat needed next season are within our production capabilities. Hay and ensilage should be fed to cows in ample time in late autumn or early winter to ensure that they winter in good condition. This will give cows a flying start in the "production stakes" for 1945-46. In culling the herd this fall, do not throw out sound cows that can do another season. Closing of paddocks for the winter rationing of grass should be given consideration.

POTATOES

37,500 acres of potatoes are wanted for next season. The average New Zealand yield per acre is 5 tons, but by careful seed selection, land preparation, inter-cultivation and spraying, the yield could readily be increased by 5 cwt. per acre, giving an extra 9,000 tons of potatoes for export to the armed services. Potato growers are urged to do all they can to increase the yield.

In planning your cropping you are urged to consult your local PRIMARY PRODUCTION COUNCIL.

FOOD IS THE FARMERS' RESPONSIBILITY

Issued by the New Zealand Department of Agriculture

EIS.A8

Roads and bridges: Owing to the rugged nature of much of the land, road-making in New Zealand has often created problems for the engineer. Many miles of roads have been built over hilly and mountainous country, and the irregular nature of the land surface has necessitated the building of a large number of bridges and tunnels.

facilities and partly to the benefits of larger-scale methods of production. This movement towards amalgamation of the working units has not, however, taken place to the same extent with cheese factories, which still tend to be distributed close to their source of supply, firstly, because the raw milk is heavy to transport, and secondly, because the milk has to be at the factory early in the morning. Thus the distance that can be travelled, even by motor truck, is limited.

Many Advantages

Farmers have gained many advantages by better transport. In the past, if a farmer lived a considerable distance from the railway, it would perhaps take him three or four days to cart his goods to the railway siding. If the farmer himself was not engaged in these operations, he had to employ men to drive his teams. Oats had to be grown to provide chaff for the horses. Today the farmer is relieved of these extra costs, and he is free at a critical time of the year to attend to other work on the farm.

The use of the motor truck for carrying goods within the farm boundary is also important. In some cases it replaces either tractor or horses.

Both rail and heavy motor transport have facilitated the use of fertiliser, and the rapid transport of stock by road has many advantages.

In some districts railway timetables are not always suitable, and here the motor truck carries a large amount of farm produce. The smaller motor trucks are able to pick up small lots of stock that it would not pay to transport by rail. Farmers owning light motor trucks are independent of rural transport services, and are able to carry their own goods to and from distributing centres. The role of the motor truck in transporting farm produce to cities is rapidly expanding. It has enabled city milk supply farms to be situated some miles from the city area. The quick transport of other perishable produce is also most essential.

The inauguration of an efficient passenger service has enabled farm dwellers to visit urban centres to transact business. Of recent years the aeroplane has become important in transporting mails and passengers to inaccessible districts, particularly South Westland, and it is likely that air transport will become increasingly popular in the future.

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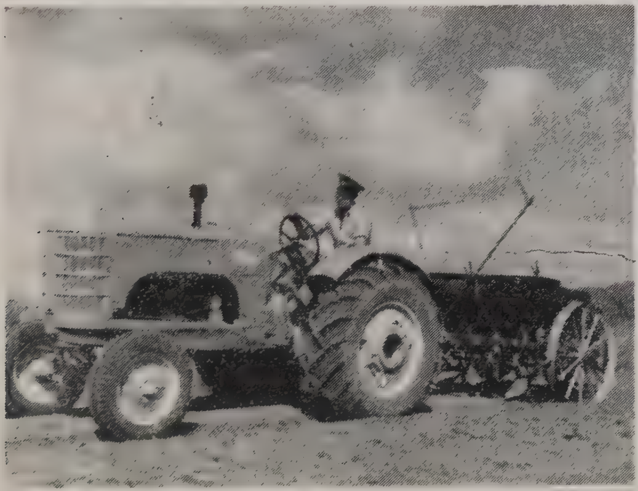
The FARM TRACTOR

NO driver can look after his tractor properly unless he knows something of the way it works. The modern tractor is a sturdy machine designed to stand continuous hard work, but it contains a certain amount of complicated mechanism. All drivers, therefore, should know enough of the working principles of a tractor to be able to undertake the maintenance of the one they use.

IF THROUGH NEGLECT OR IGNORANCE A TRACTOR DOES NOT GET PROPER MAINTENANCE—

1. **It will never be capable of undertaking its full duty.**
2. **Repair bills will be heavy.**
3. **It will break down, generally at busy times.**
4. **Its working life will be considerably shortened.**
5. **Fuel will be wasted.**

In the long run the only complete guide to the maintenance of a tractor is the instruction book issued by the makers, which is the most valuable part of the tool-kit supplied with a new tractor. Any owner who has no instruction book for his own particular model would do well to order one. But the information given therein may be rather too detailed and too technical for the newcomer to tractor work to grasp at all readily. Moreover, there is an instruction book for every single model, and the maintenance instructions given for one are not always a safe guide to the maintenance of another.



This article has been drawn up, not to replace the instruction book, but to give beginners in particular, and even in some cases "old hands," an insight into the construction and use of tractors in general. Thus they may more easily understand the detailed instructions given by the makers of the tractor they have to operate.

THE INTERNAL COMBUSTION ENGINE.

The kind of engine used in a tractor is called an **internal combustion engine**, because it converts the heat energy of fuel into mechanical work by burning the fuel inside the engine itself.

A steam engine, for example, is not an internal combustion engine because the engine part of it—cylinder, piston and so on—is quite distinct and separate from the fire-box in which the fuel is actually burnt. The fuel burnt in an I.C. engine can be any one of the following: coal or producer gas, petrol or paraffin vapour, or diesel oil in the form of a finely-atomised spray.

The general principle of all I.C. engines is the same and depends on the fact that air combined in the right proportion with any one of these fuels will form an explosive mixture. The various types of engine differ from one another only according to the fuel used, the exact arrangements for introducing and exploding it, and the number of cylinders. For tractors the most common and important type is the 4-stroke engine starting on petrol and running on a special kind of paraffin known as **vapourising oil.**

Fig. 1 shows a 4-stroke I.C. engine cut across the middle, and viewed from the end. All the most important parts will be referred to throughout by the names labelled.

Single Cylinder 4-Stroke Engine

1. **INDUCTION STROKE.**

(a) The inlet valve opens.

(b) The piston moves down the cylinder.

(c) Fuel and air mixture is sucked into the cylinder.

(d) When the piston reaches the bottom the cylinder is full of explosive mixture and the inlet valve closes.

2. **COMPRESSION STROKE.**

(a) Both valves are closed.

(b) The piston rises.

(c) The mixture in the cylinder is compressed into a much smaller space.

3. **FIRING STROKE.**

(a) At the end of the compression stroke both valves are still closed.

(b) As the piston reaches the top of this stroke a spark at the sparking plug ignites the compressed mixture.

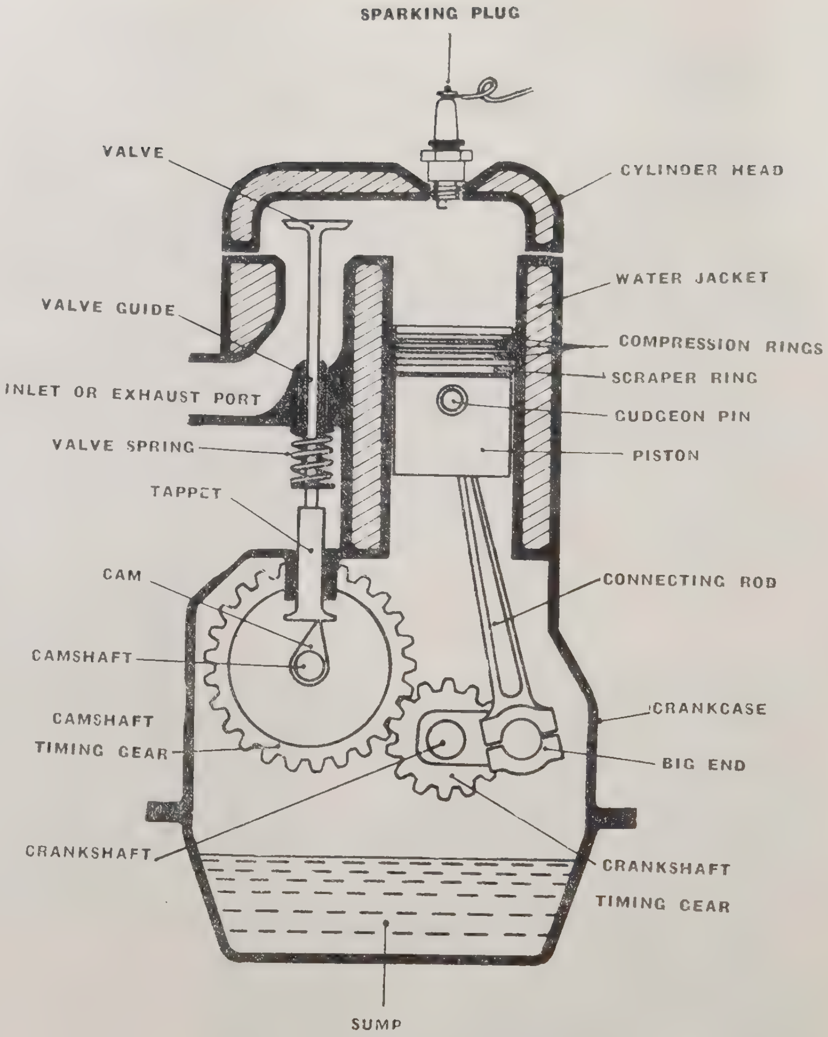


FIG. 1—THE 4-STROKE ENGINE.

(c) The force of the explosion of that mixture drives the piston down the cylinder.

4. **EXHAUST STROKE.**

(a) The exhaust valve opens as the piston reaches the bottom of the firing stroke.

(b) The piston moves up the cylinder again.

(c) The burnt gases are driven out past the exhaust valve.

(d) The exhaust valve closes.

Then once more the inlet valve opens—fresh mixture is drawn into the cylinder and the whole cycle starts over again.

An engine of this kind is called a **4-stroke engine** because, as indicated above, there are four strokes of the piston for each explosion. The explosion stroke is the only working stroke, i.e., the only one in which the piston drives the crankshaft. During the remaining three strokes of the cycle the crankshaft continues to turn round because of the momentum of the flywheel.

4-Cylinder Engine

Smoother running and a more uniform output of power will obviously result from using several cylinders with the corresponding pistons all coupled to the same crankshaft, as indicated in Fig. 3.

The vast majority of tractor engines have four cylinders working on the above principle, i.e., they have what are called 4-cylinder 4-stroke engines. In such an engine one cylinder fires for each stroke: that is, two cylinders fire during each complete revolution of the crankshaft and flywheel. The order of firing in a 4-cylinder 4-stroke engine is either 1, 3, 4, 2, or 1, 2, 4, 3, depending on the make of the tractor. The more common is 1, 2, 4, 3; but the firing order will usually be found marked somewhere on the engine. A

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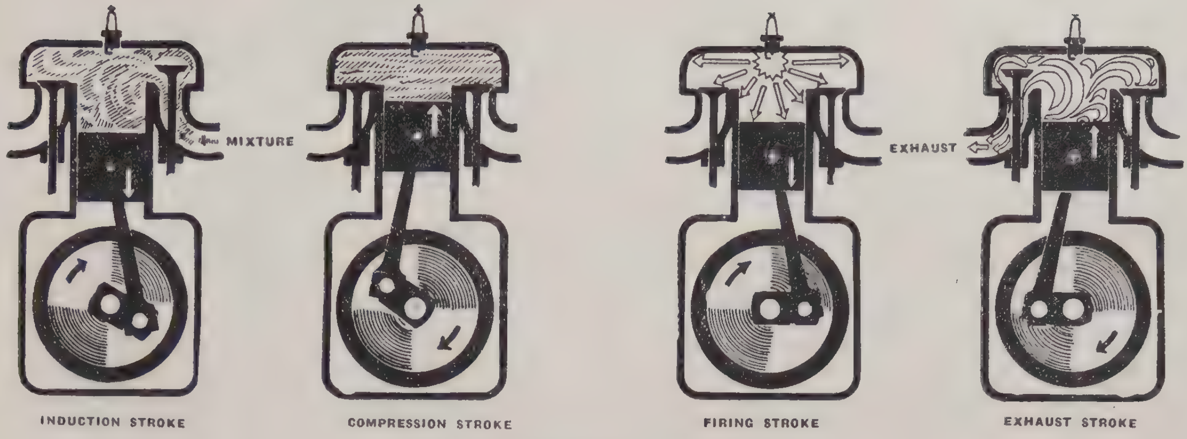

FIG. 2—THE PETROL CYCLE.

4-cylinder engine runs smoothly and gives a fairly uniform output of power because, whatever the position of the crankshaft, one or other of the pistons is actually on the firing or "working" stroke.

Petrol Starting for Tractors Running on Vapourising Oil.—Most tractors in this country use vapourising oil as fuel because it is relatively cheap. But such a tractor cannot be started from cold on vapourising oil, because this fuel will not turn into vapour until it has been warmed up. For this reason all vapourising oil tractors are started on petrol and should be run on petrol until their engines are hot enough to vapourise the normal fuel properly.

Other Kinds of Tractor Engine.—In America petrol is cheaper than it is here, so it is more often used as a tractor fuel. A petrol-air mixture can be more highly compressed than a vapourising oil-air mixture without giving trouble on the firing stroke: or, as we generally say, an engine running on petrol can have a higher **compression ratio** than an engine running on vapourising oil. With a higher compression ratio more power can be obtained from the same size of engine, and so, if it has been specially designed for the purpose, a petrol engine will generally be more powerful than a vapourising oil engine of the same size.

The Diesel Engine

In some parts of the world vapourising oil is either expensive or difficult to obtain, and the only cheap fuel is diesel oil. In these places tractors with diesel engines are popular, although some tracklaying tractors of this type are also to be found in this country. The diesel engine works on the same principle as the vapourising oil engine, but there is no sparking plug and fuel is not introduced until the end of the compression stroke. The cycle is as follows:—

1. **Induction Stroke.**
   The inlet valve opens—the piston goes down, drawing in pure air—the inlet valve closes.
2. **Compression Stroke.**
   Both valves are closed—the piston comes up and compresses the air in the cylinder. The engine has a high compression ratio and on this stroke the air is compressed so much that it gets hot—as it does in a bicycle pump when pumping up a tyre.
3. **Firing Stroke.**
   As the piston reaches the top of the compression stroke a spray of diesel fuel is shot into the cylinder through a nozzle called an injector. The heat of the compressed air is sufficient to ignite the fuel, causing an explosion, which drives the piston down.
4. **Exhaust Stroke.**
   The exhaust valve opens and as the piston comes up the burnt gases are driven out of the cylinder. The exhaust valve then closes and the cycle starts again by drawing in fresh air.

Most 4-stroke diesel engines can be started from cold, but their high compression ratio makes them difficult to turn by hand, and they often have auxiliary starting devices. Thus some diesel-engined tractors have a small petrol engine for starting them, while others are arranged so that they can start on petrol, and operate as ordinary petrol engines until they warm up.

TRACTOR COMPONENTS.

It is now intended to show how the principles of the internal combustion engine, already explained, are put to practical use in a tractor.

The Tractor Engine

The Piston must make a gas-tight joint with the inside wall of the cylinder, and yet be free to move up and down. This gas-tight fit is obtained by three or more cast-iron rings (**piston rings**), which are let into grooves

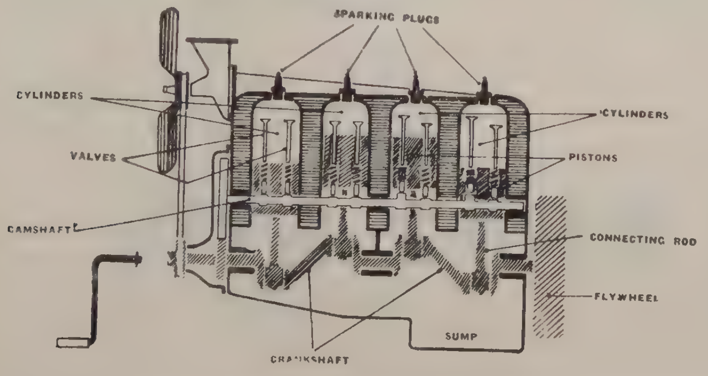

FIG. 3—THE 4-CYLINDER ENGINE.

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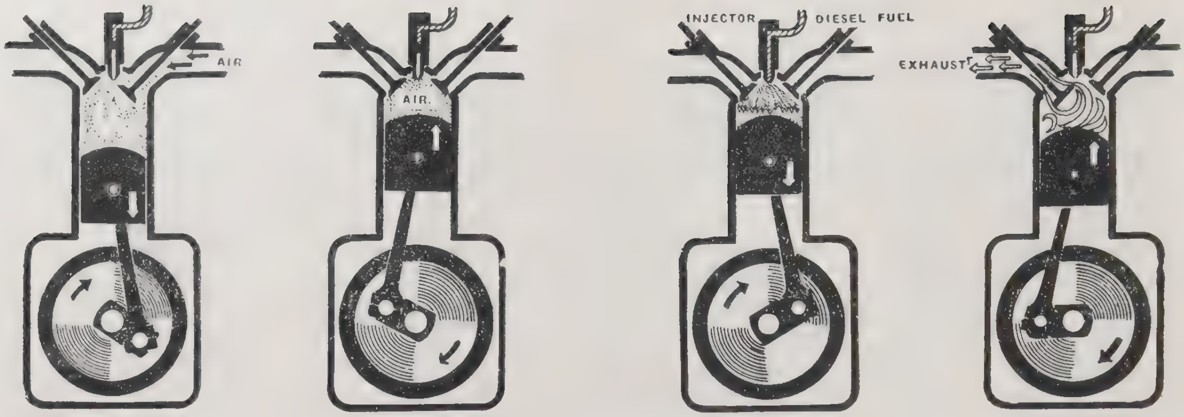

INDUCTION STROKE COMPRESSION STROKE FIRING STROKE EXHAUST STROKE

FIG. 4—THE DIESEL CYCLE.

around the piston. The rings tend to spring outwards and so project slightly from the piston and press against the cylinder wall.

The Connecting Rod is connected to the piston by the **gudgeon pin,** which passes through the **little end** bearing in the connecting rod and is supported at each end in the wall of the piston. The end of the connecting rod attached to the crankshaft is called the **big end** bearing and is in two parts bolted together round the crankshaft.

The Crankshaft, like the pedal and crank of a bicycle, turns the up-and-down motion of the piston into rotary motion, which can be used to drive the tractor wheels. The crankshaft itself is carried in bearings known as **main bearings**—in a 4-cylinder engine there can be 2, 3, or 5 main bearings, 3 being most common.

The Valves are generally of the **poppet** or **mushroom** type, consisting of a mushroom-shaped head on a central stem. They move up and down in "sleeves" called **valve guides** and are held in the closed position by **valve springs.** There are two possible arrangements—**side** valves and **overhead** valves, as shown in Fig. 5. Practically all tractors have overhead valve engines. In tractors overhead valves are operated by push rods from a camshaft at the side of the engine.

The Camshaft. The valves are opened and closed at the correct times by means of cams, which are merely projections from the camshaft. The set-

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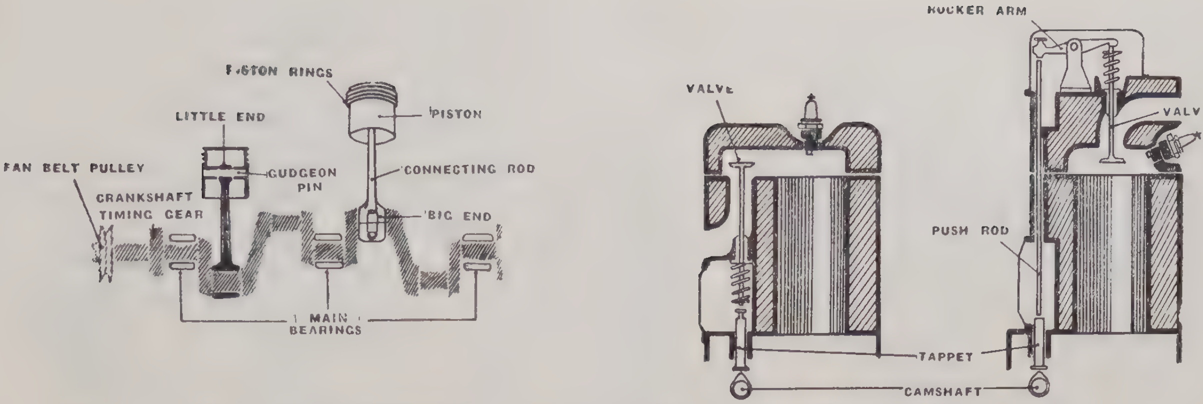


FIG. 5.—LEFT: THE CRANKSHAFT. RIGHT: SIDE VALVE AND OVERHEAD VALVE.

ting of the camshaft is of great importance in the running of the engine. On this will depend the **valve timing**, that is, the exact moments at which the valves open and close.

The Carburettor. As the piston descends, a stream of air is drawn over a small hole called the **jet**, from which it picks up some fuel and carries it into the cylinder. The jet is fed from the fuel tank through a fuel chamber containing a float. If more fuel enters the **float chamber** than the engine needs, the float will rise until the valve at the top closes the pipe from the tank. When the engine needs more fuel the float will fall and allow more to enter the float chamber. The quantity of fuel reaching the jet is controlled by the setting of a **needle valve**.

The Vapouriser. When petrol is used the fuel picked up from the jet rapidly vapourises, i.e., turns into gas. Such a mixture of air and petrol vapour explodes easily. Vapourising oil does not turn into gas unless it is heated. It leaves the jet as a very fine spray made up of small drops of fuel, which must then be heated in a vapouriser to turn them into gas.

The vapouriser is a narrow box, one side of which is heated by the hot gases leaving the engine on each exhaust stroke. When the engine has been running for a short time on petrol the vapouriser becomes hot. If the engine is then turned on to vapourising oil, the spray of fuel from the jet will be heated and turned into a gas, which forms with air an easily-exploded mixture.

The Throttle is shown in Fig. 6. It is a flat disc of metal which can be set so that it partially blocks the **induction pipe**, i.e., the pipe along which the fuel-air mixture flows to the engine. The speed and power of the engine are controlled by the amount of mixture that the throttle allows to enter the cylinders. In A the throttle is open, in B it is closed.

The Choke. The engine requires a "rich mixture" for starting, i.e., more petrol vapour in the mixture than is needed for normal running. For this reason another disc, similar to the throttle, is placed in the air intake so that the air has to flow past it before reaching the jet. Normally this disc—called the choke—is wide open, but for starting it is partially closed to restrict the flow of air and make the mixture rich in petrol. It is shown in the two diagrams of Fig. 6—on the left it is open for normal running and on the right it is partially closed for starting, i.e., the engine is "choked."

The Governor is an automatic device which keeps the engine running at the same speed whether the load is heavy or light. The governor control allows the driver to alter the speed at which the governor keeps the engine running. If the load on a tractor increases so that the engine speed tends to fall, the governor opens the throttle and gives the engine more fuel. When the load decreases so that the engine tends to speed up, the governor closes the throttle and cuts down the fuel supply.

The Magneto produces the spark at the sparking plug which fires the mixture in the cylinders. It is a small dynamo and induction (or "shocking") coil combined. When the end cover is taken off the inside will look something like Fig. 7. This shows the moment at which a spark is produced at the sparking plug in No. 1 cylinder. A spark is produced whenever the **points** of the contact breaker open, which occurs each time the end of the rocker arm passes the cams on the stationary cam ring. The spark appears at No. 1 plug because the rotor arm of the distributor is passing the end of No. 1 pluglead. In the magneto shown this rotor arm is geared to revolve at half the speed of the contact breaker, so that when the points next open the rotor arm of the

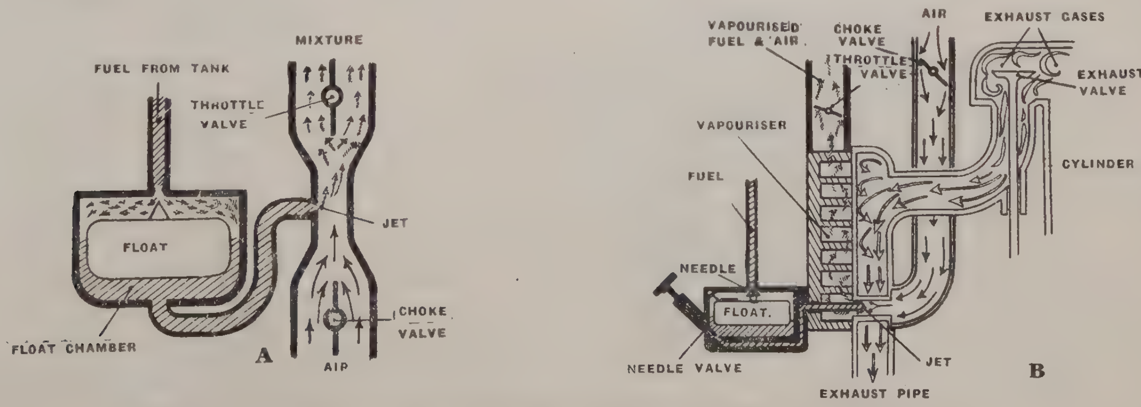


FIG. 6.—LEFT: THE CARBURETTOR. RIGHT: THE VAPOURISER.

distributor will be opposite No. 2 plug lead. The magneto must be "timed" so that the points open, i.e., the spark occurs, in the right cylinder and at the right time in relation to the position of the piston at the end of each compression stroke.

A Sparking Plug is the means whereby the mixture is ignited in the cylinder by a spark appearing at the gap between its points. Sparking plugs must be kept clean and in good order, or the spark they give will be weak. In that case the mixture will not be ignited properly: starting will be difficult and power will be lost.

It is most important, therefore, that plugs should be taken out periodically and cleaned thoroughly.

Not all sparking plugs are alike, and, whenever possible, the particular type of plug recommended by the makers of a tractor should be fitted.

The Impulse Starter is a device which makes tractors easier to start. When turned slowly a magneto gives a weak spark, making starting difficult, so while the engine is being turned slowly some means has to be found to increase the magneto speed. When the engine is turned the impulse starter prevents the magneto from turning with it until the piston reaches the top of the compression stroke. At this moment the magneto is released, and is driven round at high speed by a spring so that it delivers a "fat" spark. The spark thus produced by hand-turning is as good as the spark delivered in normal running at normal engine speed. The impulse starter engages automatically when the engine stops, and can be heard to "click" as the engine is turned over by hand. As soon as the engine starts it disengages itself automatically. Any modern tractor can therefore be started simply by pulling up the starting handle.

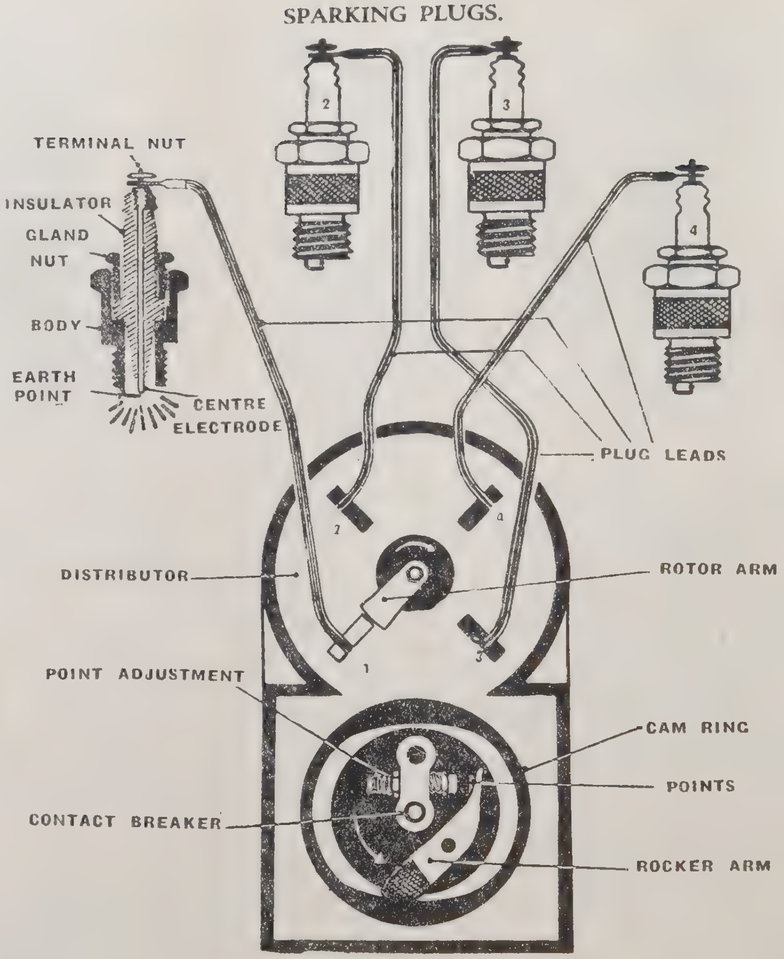

SPARKING PLUGS.
2
3
4
TERMINAL NUT
INSULATOR
GLAND
NUT
BODY
EARTH
POINT
CENTRE
ELECTRODE
PLUG LEADS
2
4
DISTRIBUTOR
ROTOR ARM
1
3
POINT ADJUSTMENT
CAM RING
POINTS
CONTACT BREAKER
ROCKER ARM

FIG. 7.—THE MAGNETO.

Lubrication System

The Lubrication System can be one of the following:

1. **Splash.** The big ends dip into trays carrying oil in the sump, and so cover the inside of the engine with oil.
2. **Pressure Feed.** Oil drawn from the sump through a screen is pumped through pipes to every part of the engine.
3. **Force Feed and Splash** is a combination of the above. Usually the big ends, little ends, and pistons are lubricated by splash and the rest of the engine by a pump feed.

Few tractors nowadays have splash lubrication systems. Most of them are wholly or partly pressure fed, and a gauge is fitted to show that oil is circulating. This should be watched during work and the engine stopped at once if no pressure is showing on the dial. In addition, an oil filter may be fitted to keep the oil free from contamination. This filter should be cleaned or replaced periodically as the makers advise in the instruction book.

Fig. 8 shows a typical pressure-fed lubrication system. After being pumped through a filter the oil is carried by pipes to the various bearings, reaching the big ends through oil-ways drilled in the crankshaft. In the drip feed to the overhead valve gear the

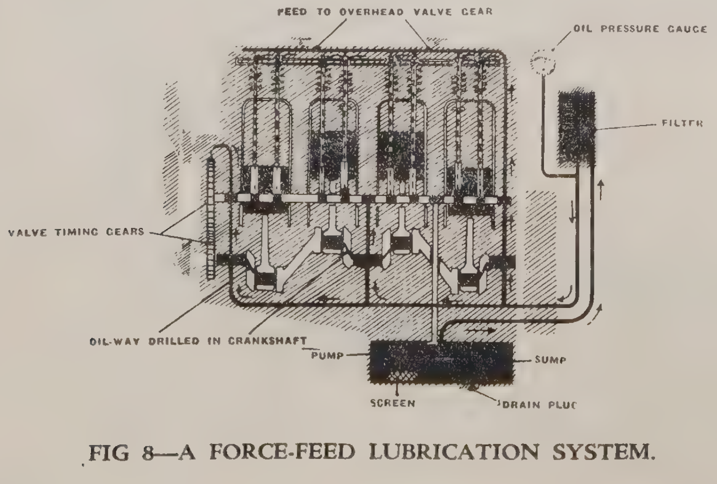

FEED TO OVERHEAD VALVE GEAR
OIL PRESSURE GAUGE
FILTER
VALVE TIMING GEARS
OIL-WAY DRILLED IN CRANKSHAFT
PUMP
SUMP
SCREEN
DRAIN PLUG

FIG 8—A FORCE-FEED LUBRICATION SYSTEM.

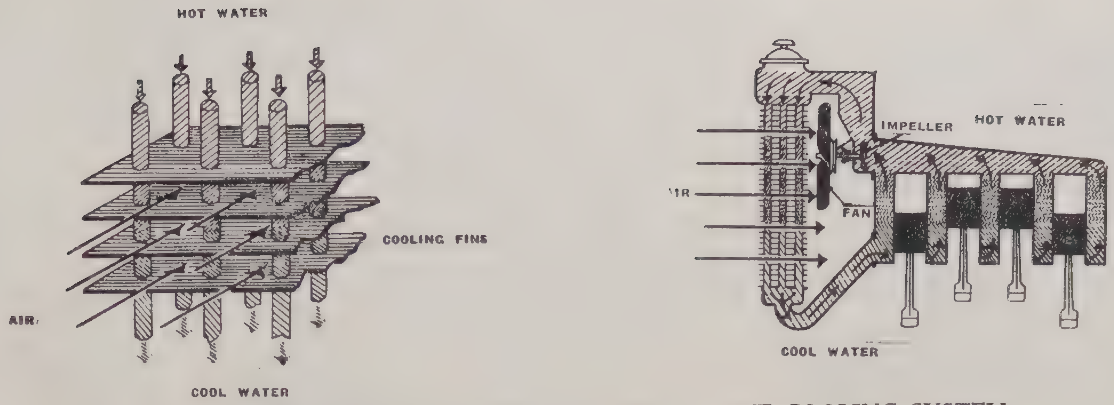


FIG. 9.—LEFT: RADIATOR SECTION. RIGHT: THE COOLING SYSTEM.

oil finds its way down the push rods and tappets to lubricate the cams before returning to the sump. Lubrication of the cylinder walls and little ends is effected by splash from the crankshaft and by oil-mist.

Cooling System

An internal combustion engine, with its large number of explosions per minute in each cylinder, needs some cooling device to prevent damage by excessive heat. Water is used, and the usual method of cooling is by the **thermo-siphon** system. In this system the water circulates because hot water is lighter than cold. Hot water from the parts of the engine nearest to the cylinders rises and passes through a pipe to the top of the radiator. The radiator is a series of tubes with fins, through which air is drawn by the fan. As the water is cooled in the radiator it becomes heavier, falls to the bottom, and passes to the lower part of the cylinder jacket, to replace the warm water leaving at the top. It is usual on tractors to have a pump or **impeller** at some point in the circuit to assist the circulation and improve the efficiency of the cooling.

In practice, tractors running on vapourising oil tend to keep too cool, especially on light loads. In a cool engine the fuel is not completely vapourised, with the result that maximum power is not developed and unburnt fuel passes the pistons to the lubricating oil in the sump with harmful effect. There are three main methods of controlling the engine temperature:

1. Radiator blinds.
2. Radiator shutters.
3. A thermostat controlling the pump circulation.

1 and 2 are most satisfactory when used in conjunction with a thermometer, which can be read from the driver's seat. The thermometer is best fitted near the top of the radiator, where the water should be kept just under boiling point. Radiator blinds can be raised to keep the engine warm for starting or during cold weather and periods of light loading, and lowered for warmer weather or heavy loads. Radiator shutters are opened and closed by a hand lever from the operator's seat.

Some tractors use a valve called a **thermostat**, which is fitted between the top of the cylinder and the radiator. When the water round the cylinders is hot enough this valve opens and allows the water to flow to the radiator for cooling.

Transmission System

The transmission system of a tractor is divided into 3 parts:

1. The Clutch may be one of two types:

(a) Single plate.
(b) Multiple plate.

The single plate clutch is the more common in modern tractors. It consists of one plate held tightly between two surfaces by powerful springs. One of these surfaces is usually on the engine flywheel, the other is attached to the shaft which drives the gearbox and back axle. Pressing on the clutch pedal parts these two surfaces so that the plate is free, and the gearbox is no longer driven by the engine. Releasing the pedal allows the **clutch springs** to clamp the plate between the two surfaces, and so to connect the engine to the gearbox. Single plate clutches are fitted in a separate compartment in the transmission system, where no oil can reach them, and are known as **dry clutches.** The multiple plate clutch consists of a number of plates, half of which are driven by the engine and half fixed to the shaft driving the gearbox. These plates are arranged alternately—one engine driven, then one that drives the gearbox, and so on. When the clutch pedal is depressed the plates are allowed to spread, so that they do not touch and drive each other. In the same way when the pedal is released the clutch springs clamp the plates together, and the engine drives the gearbox. Multiple plate clutches are usually fitted in a part of the transmission to which the engine oil can penetrate and thus, running in oil, are known as **wet clutches.**

2. The Gearbox gives a choice of tractor speeds so that the power of the engine may be used to the best advantage, and the right speed chosen for each farming operation. The gearbox is designed to allow gear-changes only when the tractor is stationary, and the gears should not be changed while the tractor is moving.

'3. **The Back Axle** is the final drive from the gearbox to the rear wheels. It consists of two **half shafts** and a **differential gear** which enables the driving wheels to turn at different speeds when going round corners.

TRACTOR TYPES.

General Purpose

The most common type of tractor in this country is the medium-sized 4-wheeled general purpose machine, which may have either pneumatic-tyred or all-steel wheels.

The power which a tractor is capable of giving at the drawbar must be transmitted through the rear wheels. No matter how good its engine may be, a tractor will be useless for farm work unless the rear wheels can grip on agricultural land, which is often loose or wet. The steel driving wheels of a tractor are therefore fitted with lugs or strakes, which bite into the soil as the wheels revolve. For the same reason if the driving wheels are fitted with pneumatic tyres, these have a deep tread and are worked at a very low pressure (12lb. per square inch). The front wheels of a steel-wheeled tractor are provided with flanges, which cut into the soil and assist steering. Pneumatic-tyred front wheels generally have a tread consisting of one or more ribs running right round the tyre, but these are less effective than the metal flange, and pneumatic-tyred tractors are sometimes awkward to steer on wet surfaces.

Rowcrop

Rowcrop tractors are specially intended for use with such crops as potatoes and other root crops, which are planted in rows and need to be hoed or cultivated for some time after they have grown above ground. The details in which rowcrop tractors differ from general purpose ones are as follows:

1. The wheels (either steel or pneumatic-tyred) are narrow enough to go between the rows without damaging the plants.

2. The wheels are adjustable on their axles for track width so that they can be made to fit rows of different widths.

3. The tractor as a whole is high enough off the ground to pass over crops in a fairly advanced stage of growth.

4. Rowcrop tractors can generally make sharper turns than an ordinary tractor, so that headlands in the field can be narrower.

This is often achieved by fitting independent brakes on the rear wheels. By braking the inside rear wheel the tractor can be made to turn short on that wheel.

These differences do not, of course, prevent rowcrop tractors from doing ploughing and cultivating. Some rowcrop tractors have only a single wheel at the front, or two wheels so close together as to behave practically as a single wheel. This feature makes it still easier for the tractor to turn sharply, and avoids the extra complication of adjusting the spacing of the front wheels to fit different row widths. Three-wheeled tractors are, however, less convenient for general farm work.

There is a tendency in later tractor models to combine some of the rowcrop and general purpose characteristics in the same tractor. This gives a general purpose tractor with fairly high clearance, adjustable wheels, and independent brakes on the rear wheels. Such a type may be found to be of more use on a farm where the acreage warrants the use of only a single tractor.

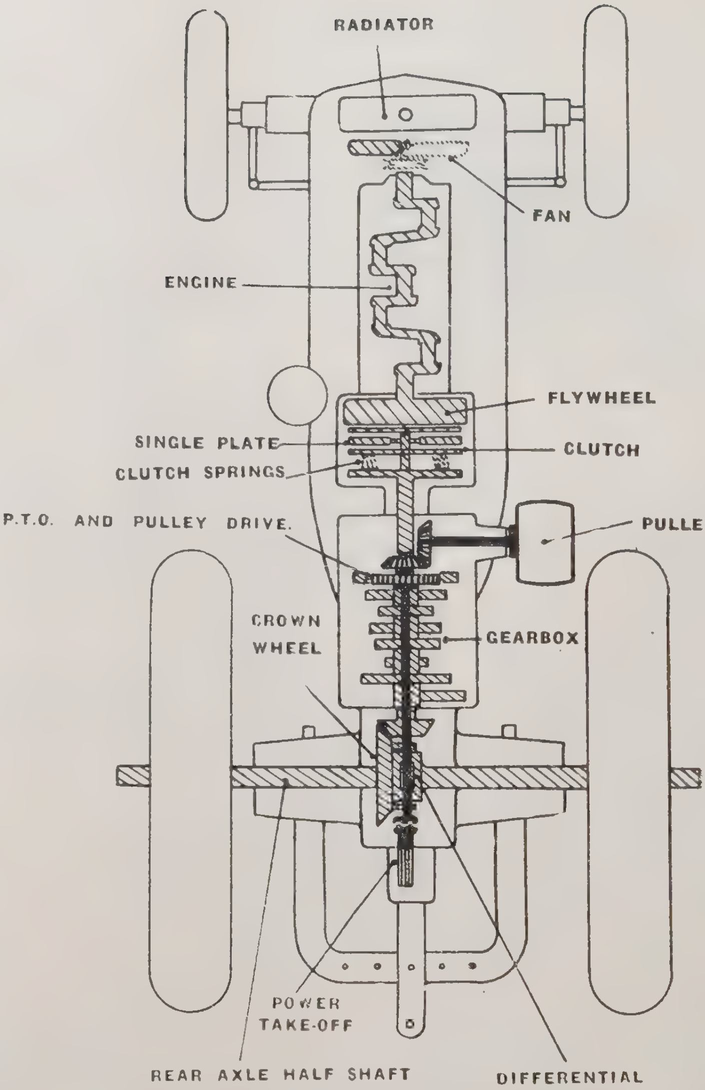


FIG. 10—THE TRANSMISSION SYSTEM.

Tracklaying

The third type of tractor is the "tracklaying" or "crawler" machine, on which the land wheels are replaced by an endless flexible track. These machines behave as if they were running, not on the surface of the soil, but on steel rails which they pick up and re-lay in front of themselves as they travel along. They have two very real advantages: they get a much better grip, especially on loose surfaces, than any other type; and, because of the very large area of contact between the tracks and the ground, they do not compress the soil to the same extent as a wheeled tractor of similar weight. They are not very common, however, because they are relatively expensive both to buy and maintain, although from an engineering point of view they are more efficient. Most of the tracklayers used are relatively powerful machines—**in fact, a really powerful tractor is almost bound to be fitted with tracks because there is a limit to the pull which a pair of wheels of ordinary size can transmit.**

Steel and Pneumatic Tyres

In designing driving wheels to transmit the heavy pulls required from an agricultural tractor, engineers are facing two difficulties. If, as in the case of steel wheels, the rim is fitted with deep lugs or strakes, the grip is efficient, but an appreciable proportion of the total power output of the engine is liable to be wasted in pushing the lugs into the soil. This loss of power is generally called **rolling resistance,** and is roughly proportional to the speed at which the tractor is travelling. A steel-wheeled tractor cannot be geared to work at a very high speed because it would use up all the power of the engine in getting itself along and have none to spare for pulling an implement.

If, on the other hand, the wheel has a relatively smooth surface, as is the case with pneumatic tyres, the rolling resistance loss is smaller, but power is liable to be lost in **wheel slip.** Everyone knows what wheel "spin" is—for example, when the rear wheels of a motor-car spin round on snow or some other slippery surface so that the car comes to a standstill. Wheel "slip" is the same sort of thing in a less acute form: the car or tractor does not come to a complete standstill, but it travels forward a much shorter distance than it ought to for each revolution of its driving wheels. In such a case the wheels may be turning five times in order to move the tractor 50 feet along the ground, when if there were no wheel slip four times would do. This leads to:

1. **Waste of fuel.**
2. **Loss of power at the drawbar.**
3. **Excessive wear on rubber tyres.**

Steel wheels are more suitable for slow, heavy work like ploughing and cultivating, while pneumatics are better for light work like harrowing, manure distributing, or haymaking, which can generally be done at higher speeds. Alternatively, when the same tractor can be fitted with either steel or pneumatic-tyred wheels, it should be worked mainly in the lower gears when fitted with the former and in the higher gears when fitted with the latter. Pneumatic tyres are especially suitable for haulage, and they are almost essential if the tractor is to be used for this work on public roads. Steel-wheeled tractors cannot travel on the roads at all, until they have been fitted with road bands or some similar device for preventing damage to the road surface, and the road bands must be removed again before the tractor can work efficiently in the field. In addition, the grip of road bands is not good enough to allow the tractor to pull any appreciable load on road surfaces.

While on this subject it is worth noting that although tracklaying tractors are highly efficient as regards both rolling resistance and wheel slip, they should always be worked in the lowest possible gear. This is because of **track wear** which increases more or less in proportion to the speed of travel. Track wear is the most expensive item among maintenance costs, and on sandy or "cutting" soils it may be so great that it is not economic to use a crawler tractor at all. Large implements are necessary to use the full power of a crawler in a low gear.

Tractor Capacity

In some of the preceding paragraphs such terms as "medium-powered," "relatively low-powered," and so on have been used without explanation. The engineer's measure of a tractor's capacity is its **drawbar horse-power.** But this "horse-power" bears no relation to the work a horse can do on a farm, i.e., one cannot assume that a 10-horse-power tractor will do the work of 10 horses. And so, although a farmer will recognise that a tractor of 15 h.p. is 50 per cent. more powerful than one of 10 h.p., he will probably not know how much to expect from either of them in a day's work when pulling, say, a plough or a cultivator. For this reason another kind of measure is commonly adopted for use on the farm. Instead of specifying the horse-power we sometimes specify how many furrows the tractor should plough at once. This measure is inexact, because the pull required by a given plough will vary with soil, working conditions, and the speed of work. Some standards have to be fixed; these are:

1. **Speed.** Most ploughing is done at about 3 m.p.h., so this figure is taken.
2. **Land.** This is given as "average land." That is, land which needs 2 good or 3 moderate horses on a single-furrow plough at normal width and depth of furrow.

Under these conditions each furrow ploughed needs about 5 h.p., so that—

A 5 h.p. tractor should pull one furrow on average land.

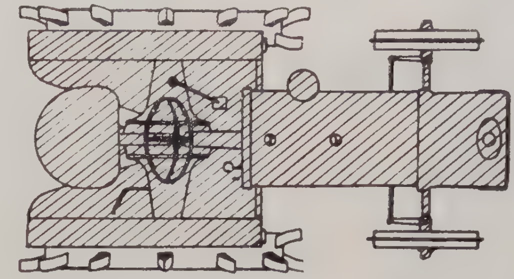
A 10 h.p. tractor should pull two furrows on average land, and a medium-sized tractor of about 15 h.p. should pull three furrows on average land.

When the number of furrows that a tractor should pull is known the correct widths of other implements can be estimated. For each 10in. furrow a tractor should pull:

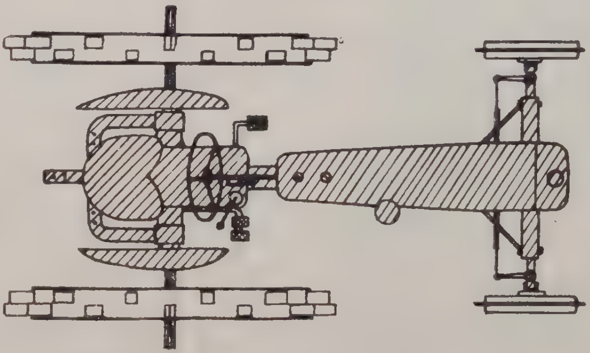
3 times the furrow width of cultivator or disc harrow, i.e., 2ft. 6in.

6 times the furrow width of heavy harrow, i.e., 5ft.

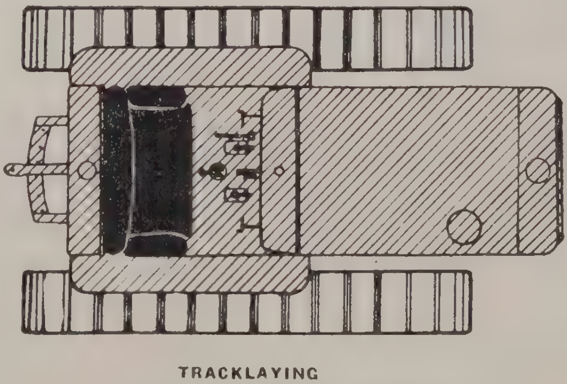
5 times the furrow width of drill or binder, etc., i.e., about 4ft.



GENERAL PURPOSE

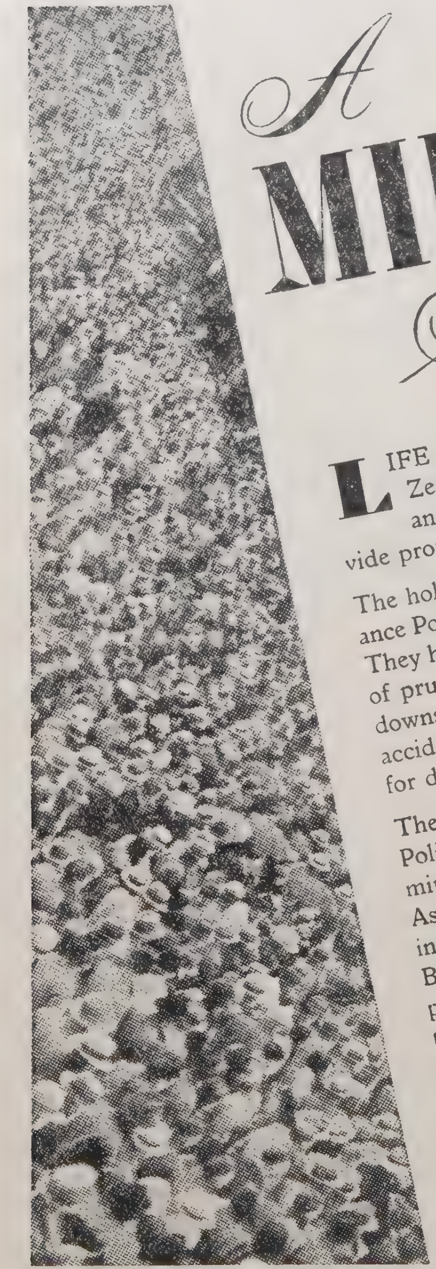


ROWCROP WITH ADJUSTABLE FRONT WHEELS



TRACKLAYING

FIG. 11—TRACTOR TYPES.



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in New Zealand

Thus a 3-plough tractor will handle a 7ft. 6in. cultivator or disc harrow, 15ft. of heavy harrow, 12ft. of drill, or two 6ft. binders, etc. This gives only an indication; the tractor may pull a bigger implement in easier conditions, and may need a smaller implement in more difficult conditions.

Tractor Loading

In the interests of economy it is important that tractors should be fully loaded. But they should not be overloaded, so that the engine speed is greatly reduced.

There are three ways of adjusting the load to give economical working.

1. **The setting of the implement.** Ploughs may be set for wider furrows or have another furrow added, if the load is insufficient. A cultivator may have the two outside tines removed if the tractor is overloaded.
2. **Hitching implements together.** Seed harrows may be coupled behind a drill—a roller behind disc harrows, etc.
3. **Using a higher gear.** Light harrows or a drill may be a load in second gear and not in first. It is more economical for a tractor, with the same implement, to work throttled down in second gear than at full throttle in bottom gear.

TRACTOR OPERATION.

As a first step in driving a tractor, the operator should familiarise himself with the controls. These are:

Engine Controls

(a) **Throttle or Governor Lever.** As has been explained, the control of the throttle is effected through a governor, and not, as in the case of a motor-car, directly by the operator. The governor control lever is always hand-operated. It does not require continual adjustment during work, since the governor automatically controls the engine's response to varying loads.

(b) **Ignition control.** There may be an advance-retard lever and an ignition switch. Some tractors are not fitted with any advance-retard control, but there is always some way of switching off the ignition.

(c) **Choke.** There will be some method of choking the engine for starting. Very often this is only a piece of wire attached to the choke, and it may be found by the steering wheel or at the front of the tractor near the starting handle.

Transmission Controls

(a) **Clutch.** The clutch may be foot- or hand-operated; sometimes both types are fitted to the same tractor. On most tracklaying machines there are, in addition to the transmission clutch, separate clutches in the final drive to each track. These are hand-operated.

(b) Gearbox. A tractor is not started like a car, by working through the gearbox from bottom to top gear, but is driven off in the gear to be used. Similarly, if the gear is to be changed, the tractor must be brought to rest before making the change. **It is very dangerous to try to start the engine without making sure that the tractor is not in gear. The operator should be certain that he knows from the feel of the gear lever when it is in the neutral position and see that it is there before attempting to start the engine.**

(c) Brakes. There are various arrangements made for braking different tractors. Some tractors are fitted with independent brakes on the two driving wheels to assist in turning quickly. Tracklaying machines have independent, foot-operated brakes for the two tracks, and these also are used for turning.

Starting the Engine

First see that the gear lever is disengaged and in the neutral position.

The engine must be started on petrol; see that the vapourising oil tap is closed, and the petrol tap open, or if the tractor is fitted with a two-way fuel tap, see that it is in the petrol position. Make sure that there is some petrol in the petrol tank. See that the radiator blind is pulled up as far as it will go to cover most of the radiator.

Now switch off the ignition and retard the spark. Many tractors have a combined switch and spark control lever; set this in the "off" position.

Pull the governor control lever one-third out.

Pull the choke right out and give four sharp upward pulls to the starting handle. This primes the engine ready for starting. **The starting handle should always be pulled up. To avoid possible injury from back-firing get into the habit of cranking with the thumb on the same side of the handle as the fingers.**

After priming the engine open the choke a little, and switch on the ignition, leaving the spark fully retarded. A sharp pull on the starting handle should now start the engine. **The engine may take two or three pulls before it fires. Do not re-prime it by pulling out the choke again, unless it is certain that it was not primed properly the first time,** since an over-overchoked engine must be turned over several times to pump out the excess fuel before it will fire. After starting, if the engine is very cold, it may need choking slightly until the vapouriser is warmed. Push the choke in as soon as the engine begins to "take hold."

Moving Off

Depress the clutch pedal right down and move the gear lever from neutral into the gear which is to be used. In some tractors it may be difficult to get the gear to go in at the first attempt. If this is so, re-engage the clutch, then depress the pedal and try again. Should this also fail, keep the clutch pedal down, hold the gear lever firmly in the direction you wish it to go to engage the selected gear, and very gradually release the clutch. If this is done very slowly, the gear will slip in easily. When in gear advance the ignition to the working position, and open the governor lever until the engine is running at working speed. Now ease the clutch, allowing the engine to take the load gradually. When the clutch is fully engaged remove your foot from the pedal entirely, as "clutch riding" wears out the clutch thrust mechanism.

If the clutch is let in suddenly, there is a big shock on the transmission, a danger of stopping the engine, and, where the load is heavy, a danger of causing the tractor to rear up, raising the front wheels off the ground. Should this occur, "throw" the clutch at once and the front will return to the ground. This is most likely to occur with a very heavy load, when the rear of the tractor is in a hollow or furrow, or when the tractor is facing up a hill, and great care should be exercised in moving off from such positions.

Once the tractor moves off the governor will control the engine, maintaining an even speed, although the load may fluctuate.

Steering

Steering a wheeled tractor calls for no comment, since it is exactly the same as steering a car or lorry. A tracklaying tractor, however, cannot be steered in the same way as one with wheels; one of the tracks must be declutched or braked so that the other one pushes the tractor round. Instead of a steering column and wheel it will have a lever and a pedal on each side, so that when the left hand lever is pulled, and the pedal depressed, the tractor will turn to the left, and vice versa. It follows that a tracklaying tractor can turn in its own length by spinning round on one track. This is to be avoided as a general practice, and used only in an emergency, owing to the unnecessary strain thus imposed upon the tracks. In turning a tracklayer in ordinary work the inside track should be kept moving.

SUBSEQUENT OPERATION.

Radiator Temperature

If there is a radiator thermometer or temperature indicator, watch it during the first five minutes after starting. When it indicates about 190deg.F. or the pointer is in the green section of the scale, change over to vapourising oil by first closing the petrol tap, and then opening the vapourising oil tap, or by changing the tap over if the tractor is fitted with a two-way tap. The radiator blind must be partially lowered, covering only so much of the radiator as will serve to prevent the temperature from falling below 190 deg.F., or the indicator from pointing to the "cold" section of the scale. **If the tractor has no temperature indicator or thermometer, plough the first bout on petrol, or run the engine for at least five minutes on petrol before changing to vapourising oil.** When first on vapourising oil leave the blind fully up until the engine just boils.

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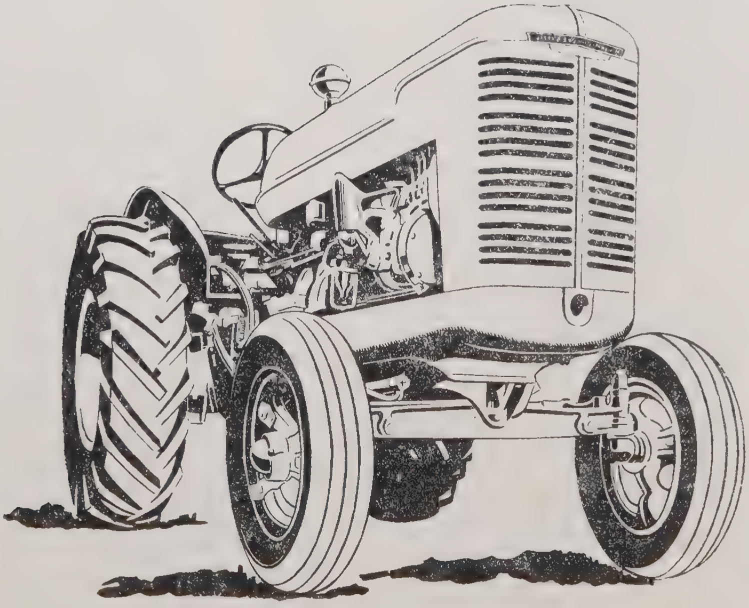

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This will be indicated by a wisp of steam coming from the radiator.

The blind should now be lowered a few inches. If steam appears again, repeat the lowering of the blind until a point is found where steam ceases to show at the bottom of the radiator. Then the water temperature will be maintained just below boiling, and should be kept as near this temperature as possible during all work. No great harm is done if the water boils, so long as the radiator does not boil dry, **but considerable damage can be done by keeping the engine too cool.** This allows unvapourised fuel to reach the cylinders and so go past the pistons to the sump, where it dilutes the oil and destroys in great part its lubricating qualities. **Should the engine inadvertently be allowed to boil dry, do not add fresh water until the back of the hand can be comfortably applied to the cylinder head, otherwise there is a danger of cracking the cylinder block by sudden cooling.**

If the engine is stopped for any reason during work and stands for longer than a minute or two, it must be restarted on petrol, as the vapouriser soon becomes too cool to vapourise the heavier fuel.

If the weather has been cold, try, during the last hour of each day's work, to bring the radiator water almost to the boil by raising the blind. This will evaporate unwanted fuel from the lubricating oil and preserve its quality.

Jet Setting

Where a variable jet is fitted to the carburettor on a tractor engine it is of the utmost importance to see that it is correctly set. With an incorrectly set jet a tractor may use nearly double the normal quantity of fuel in a day without doing any more work. Therefore the jet should be set as follows:

1. Put the tractor in work, e.g., ploughing.
2. As the tractor is working screw the needle down gradually until the engine begins to falter and lose power.
3. Open the jet 1-8 to ¼ of a turn.

This setting should be checked on a number of jobs to ensure the maximum fuel economy for varying loads.

Stopping the Tractor

Throttle the engine down to about half-speed and retard the spark. Put the clutch out, move the gear lever to the neutral position, and let the clutch back. If the tractor is on pneumatics and rolls forward, apply the brake, or anchor the clutch pedal down.

Turn on to petrol for a minute or two before stopping the engine. Finally switch off the ignition and put the tap in the closed position.

On no account must the engine be allowed to stop with vapourising oil in the vapouriser, as it will prove very difficult to start after it has cooled off. Should this be allowed to happen, the float chamber must be drained through the drain cock at the bottom before the petrol is turned on.

Note that if the vapourising oil tap is opened while the petrol tap is open, some vapourising oil will find its way into the petrol tank and mix with the petrol, rendering starting difficult, **so be careful to see that both taps are never open together.**

Coupling to Implements

The tractor must be reversed back to the implement until the jaws of the implement hitch fit over the drawbar plate, and the clevis pin is pushed into place, locking the two together.

The operation of backing the tractor on to an implement calls for a considerable degree of care. This operation has been the cause of many accidents. Halt the tractor 18in. or so from the implement and throttle the engine right down so that it is just ticking over. Now ease the clutch in very carefully so that the tractor moves back on the implement very slowly. **On no account take the foot off the clutch pedal, and be ready at all times to "throw" the clutch at once.**

When coupling to an implement with a rigid drawbar a helper is generally needed. He should hold the drawbar so that as the tractor backs the tractor hitch-plate enters the jaws of the drawbar clamp. **The helper should stand in such a position that he can readily get out of the way if something goes wrong. He must certainly not get on his hands and knees, for example, to see better what is happening.** If the clevis pin is held in position on the top of the drawbar clamp, it can be pushed down as soon as the holes come into line and thus secure the tractor. It is often difficult to hold the tractor in exactly the right position, because when the clutch is "thrown" the tractor rolls forward an inch or so. With a plough the drawbar can often be brought into alignment by moving the hitch control lever, or by pushing on the land wheel of the plough to move it forward slightly.

When coupling to an implement with a flexible chain hitch there is no trouble: just put the tractor near enough to the implement to come within the range of the hitch and pin the clamp to the drawbar plate.

TRACTOR MAINTENANCE.

Full instructions for the maintenance of the tractor are given in the makers' handbook, and these will differ in detail between various makes. The general principles are the same, however, and are set out here.

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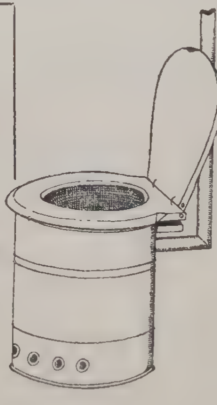

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Daily Routine

1. **Cooling system. Inspect the radiator and see that it is full of water.** Always use soft water, i.e., rain water, since hard water deposits scale and renders the cooling system less efficient. In any case the water must be clean and free from mud and sediment. In winter an anti-freeze mixture is sometimes used. This contains a liquid, e.g., glycerine, which has a lower freezing point than water, and so remains liquid during a frost.

If a tractor is to be left out at night in cold weather, and NO anti-freeze mixture is used, then the water must be drained out of the radiator and cylinder block overnight and replaced next morning. When empty a "No water" notice should be hung on the radiator cap to avoid the risk of starting up before refilling. Water expands when it freezes and the expansion is sufficiently powerful to crack the cylinder block and damage the radiator if water is allowed to freeze in the cooling system. With some tractors it is necessary to drain the block and radiator separately. There are then two drain cocks, both of which must be opened. In the case of an engine fitted with a thermostat it is advisable when possible to use anti-freeze compound, and not to drain it, because sometimes when starting up with the air temperature well below freezing point the cold air sucked through by the fan will freeze the water in the radiator before the thermostat opens and starts the warm water circulating.

2. **Crankcase Oil.** With the tractor on level ground and the engine stopped, pull out the dipstick, wipe it clean, replace it for a second, then take it out and read the oil level. It should be at the mark F on the dipstick. If it is below the mark, "top up" with clean engine oil.

3. **Greasing.** Go over **all** the grease nipples with a grease gun. This should be done methodically, starting at a definite place, such as the steering column, and going round the tractor greasing all points in the order in which you come to them. If the operator goes from point to point in no particular order, some are sure to be missed.

When greasing round remember that even if the bearings are not short of grease, the grease already there will contain grit accumulated during the previous day's work. A mixture of grease and grit forms a grinding compound which causes excessive wear on bearing surfaces. The grease gun therefore should be used until clean grease oozes out of the joints; this ensures that the old grease in the bearings is changed for new which is free from grit. At some grease points, such as on the thrust race of a dry clutch, the actual part being greased cannot be seen. In such cases two or three strokes with the grease gun are enough. Finally, if there is a water pump greaser, it should be given one turn down.

Tracklaying tractors have even more grease points than wheeled tractors. These will be found in the instruction book for the tractor concerned.

Weekly Routine

1. **Gearbox and Final Drives.** Check the oil level in the gearbox, and in the final drive case, where this is separate, and if necessary "top up" with appropriate gear oil.

2. **Air Cleaner.** Examine the oil in the air cleaner and, if it is dirty or there is any sediment, drain it out, clear away the sediment, and refill with fresh oil.

The engine oil drained from the sump is in most cases quite satisfactory if put into the air cleaner. Very often bad starting is due to the oil in the air cleaner being too thick to allow air to be drawn through it easily; used engine oil is a relatively thin oil and prevents this trouble.

3. **Water Pump.** Remove the water pump greaser cap and refill it with special hard W.P. grease. The soft grease which is used in the grease gun must **not** be used for the water pump, as it melts at the working temperature of the engine and is lost in the water.

4. **Sediment Bowl.** Remove the sediment bowl and empty the fuel, water, and dirt collected in it; clean the gauze filter if necessary.

5. **Engine Oil. In vapourising oil tractors this should be drained and replaced by new oil every 50-60 working hours,** or after a full week's work. Diesel engines and petrol engines do not need such frequent draining. Drain the oil at the end of the day or at a meal time when it is warm and will flow out readily.

Clean the screen in the crankcase with petrol before replacing the drain plug. In some cases an oil filter is fitted to the engine: this should be cleaned according to the maker's instructions, whenever the oil is changed. On no account should the crankcase be washed out with vapourising oil before refilling with clean oil. **Used oil should be saved and stored in clean dry tins;** it can be used for a number of purposes, including:

1. Filling the tractor air cleaner.

2. Lubricating a number of farm implements.

3. Painting on plough mouldboards and other bright parts of farm machinery to prevent rusting.

4. As a wood preservative.

5. As an insecticide for poultry houses.

6. As a weed-killer.

6. **Tyres.** Check the tyre pressures: rear tyres should be at 10-12lb. and front tyres at 24lb. pressure.

7. **Cleaning Down.** It pays at this time to clean the mud off the tractor and generally freshen up the machine; the transmission housing and engine should be wiped over with an oil rag to clear off oil which may have spread over the machine and picked up dust. At the same time notice whether there are any loose bolts—e.g., the wheel-holding bolts or spud bolts may be slack—or whether there are leakages of fuel or oil. Early attention to small points like these will save serious breakdowns and add to the serviceable life of the tractor.

Other Points to Check

1. **Transmission and Final Drives.** These should be drained once every season and refilled with the appropriate grade of gear oil.

2. **Magneto.** Put a few drops of light oil on the bearings now and again. An occasional examination of the contact-breaker gap should be made. When fully open this gap ought to be about 0.020 of an inch. Feeler gauges can be purchased for testing this.

3. **Radiator.** Once every six months drain and flush the radiator. If the pores have become blocked with chaff or dust, this can be removed by hosing the back of the radiator, and so washing out the obstructions.

4. **Sparking Plugs.** About once a month the sparking plugs should be removed, cleaned if necessary, and the gaps adjusted to about 0.030 of an inch.

The operator should keep a log book in which he can note down the amount of fuel and oil which he uses, the number of hours worked, the implements used, and the dates on which each routine service has been given. In this way it is easy to be sure when the tractor needs draining and refilling with fresh oil and so on. Otherwise these attentions tend to be forgotten and the tractor runs with old oil longer than it should.

The figures give a check on the fuel which the tractor uses and soon show when it is beginning to get out of adjustment and to use more fuel than it ought.

TROUBLE HUNTING.

While it is not advisable for the operator to attempt to repair a serious breakdown, the tractor sometimes fails to work because some little thing is out of adjustment. The detection of the faults listed here should be within the compass of any competent driver who takes an interest in his machine.

If Engine Fails to Start

Any one of the following may be the cause of an engine not starting:

Fuel System.

1. Fuel (petrol) tank empty.
2. Fuel turned off.
3. Attempting to start on vapourising oil.
4. Engine overchoked or underchoked.
5. Sediment bowl on fuel line choked, or water in the fuel.
6. Water or dirt in vapouriser or jets.

Ignition System.

1. Ignition switched off.
2. Plugs oiled up—plug-points gap wrong.
3. Water on high tension leads or distributor.
4. Water in the magneto.
5. Impulse starter not functioning or out of time.
6. Contact-breaker points stuck open.
7. Short circuit in ignition switch.
8. Magneto failure.

If the engine fails to start, see that the petrol and ignition are turned on. Drain some fuel from the carburettor and smell it to make sure it is petrol. If you have been trying to start on vapourising oil, drain the carburettor and run some petrol right through and out of the drain cock. The mixture may be too lean, or too rich. If the engine is overchoked, liquid petrol will have been drawn into the cylinders and the plug points short-circuited. In this case the plugs on removal will be found to be wet. While they are out swing the engine once or twice to expel some of the rich mixture, wipe and replace the plugs, and try again without choking.

If the plugs are not oiled up, check that the magneto is giving a spark by detaching a cable from a plug and holding it, by the insulation, about a quarter of an inch from the cylinder head while the engine is being cranked. If there is no spark, check that the contact-breaker points are clean and opening. If they are, then look for water in the magneto.

If the magneto is in order, check whether the plugs are sparking properly by laying them, with leads attached, on a shaded part of the cylinder head so that the metal body of the plugs is in contact with the metal of the engine. Watch for the spark as the engine is cranked. If a plug does not spark take it to pieces, clean off the carbon from the electrodes, and reassemble. Some plugs cannot be dismantled—these must be cleaned with a wire brush as well as possible. The gap should be about 0.030in., or roughly the thickness of a matchbox top. When making this adjustment it is important to bend the earth point and not the centre electrode. If the gap is too wide, it will prevent the spark occurring when starting, though the plug may spark satisfactorily when the engine is hot and running at speed.

If the carburettor is getting petrol and the plugs are sparking, make sure that the jet is not choked.

If Engine Stops Suddenly

Sudden stoppage may be due to:

Fuel System.

1. Fuel tank empty.
2. Engine overheated from lack of oil or water.
3. Dirt in the jet or fuel pipe.
4. Water in the fuel.

Ignition System.

1. Contact-breaker points stuck open.
2. Magneto shorting.
3. Magneto failure.

If the engine stops suddenly, see that there is fuel in the tank. If there is fuel present, see that it is reaching the carburettor. If it is, check the ignition system. Usually if there is an obstruction in the fuel line, the engine will begin to falter and then go on again, due to the irregular supply of fuel. This is an indication to clean out the jet and fuel pipes. If the engine has stopped through being overheated, the cause should be obvious to the driver, as the tractor will be found excessively hot on inspection, and oil fumes will rise from the crankcase.

If the engine has stopped because of water in the fuel, the only remedy is to drain the tank and carburettor and refill with fresh, clean fuel, making sure that the tank is completely drained, because any water in the fuel collects at the bottom of the tank.

If Engine Runs Irregularly

Lack of power and irregular running may be due to:

Fuel System.

1. Mixture too lean.
2. Mixture too rich.

If the mixture is too rich, the engine will show black smoke at the exhaust and fail to pick up speed. If too lean, the engine will run irregularly and tend to backfire. The remedy in either case is to adjust the needle valve or the jet until the engine runs regularly with no exhaust smoke. If it is found impossible to obtain good running by adjusting the needle valve, then probably one of the following faults is present:

1. Choked fuel line, jet, or sediment bowl.
2. Air leak in intake manifold.
3. Punctured float.
4. Vapouriser choked with carbon deposit.

If the float is punctured, it will cause too rich a mixture. An air leak in the manifold causes too lean a mixture. If the fuel line is dirty, the engine will run regularly without load, but snatch and falter when the load comes on.

Irregular running may also result from any of the following faults:

Ignition System.

1. Dirty plugs.
2. Incorrect plug point gap.
3. Magneto contact-breaker points out of order.
4. Leaking sparking plug washer.
5. Advance and retard mechanism out of order.
6. Broken carbon brush in magneto.
7. Oil inside magneto.

If the engine is firing irregularly, set the throttle until it is running at a fair speed, and then, using a screwdriver with a wooden or bakelite handle, "short" each of the plugs in turn by placing the blade of the screwdriver on the cylinder block and touching the plug terminal with the shank. This shorts the plug and stops it from firing. If the plug is working properly, a change in the beat of the engine will be heard when the plug is shorted in this way. If no difference is heard in the beat of the engine, then that is the offending plug. Take it out, clean it, and check the point clearance. If this fails to put the fault right, see that the distributor and contact-breaker are in order. See that the advance and retard lever is working, and whether the magneto brush is worn, or the commutator oily.

Mechanical Faults

Mechanical faults are usually outside the scope of the operator. Any unusual noise should be investigated, and, if the cause is not immediately obvious, the advice of a skilled mechanic should be obtained.

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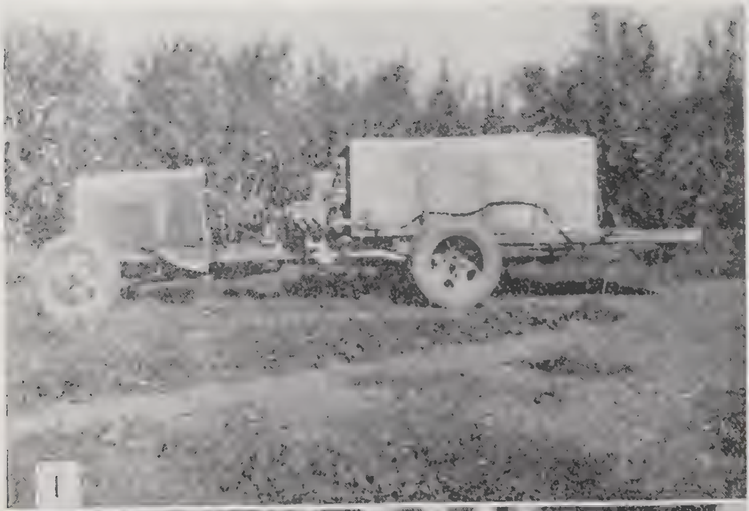
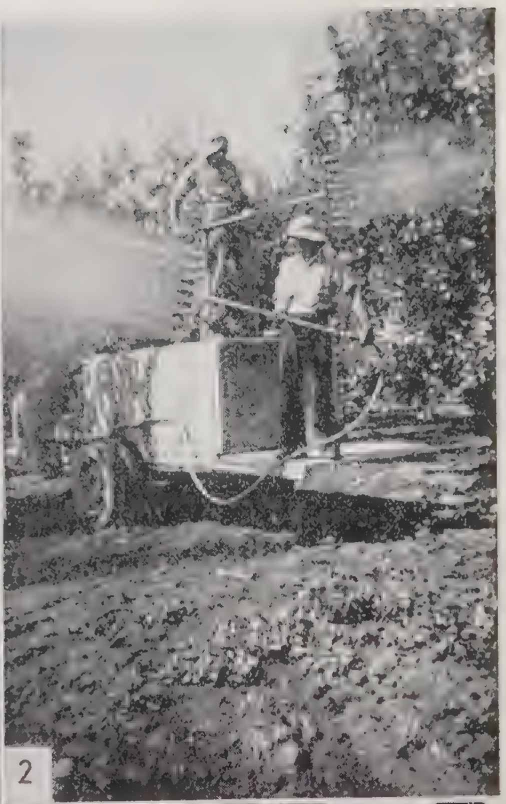
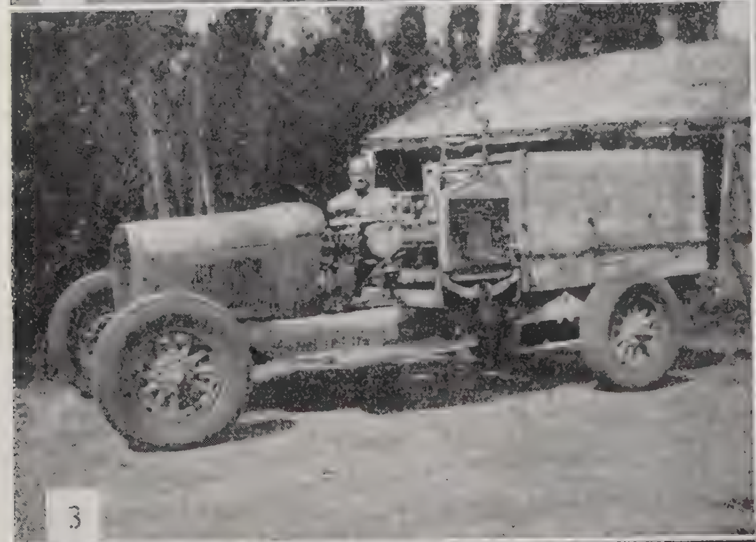
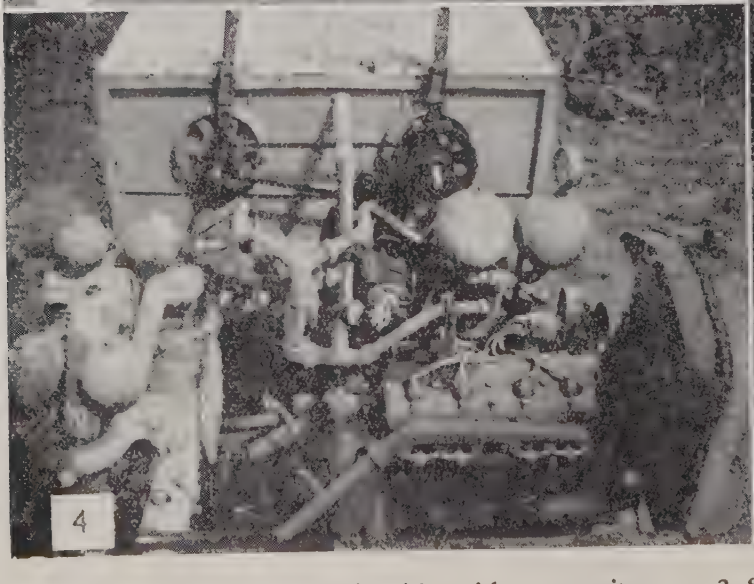
SHORTAGE OF TYRES

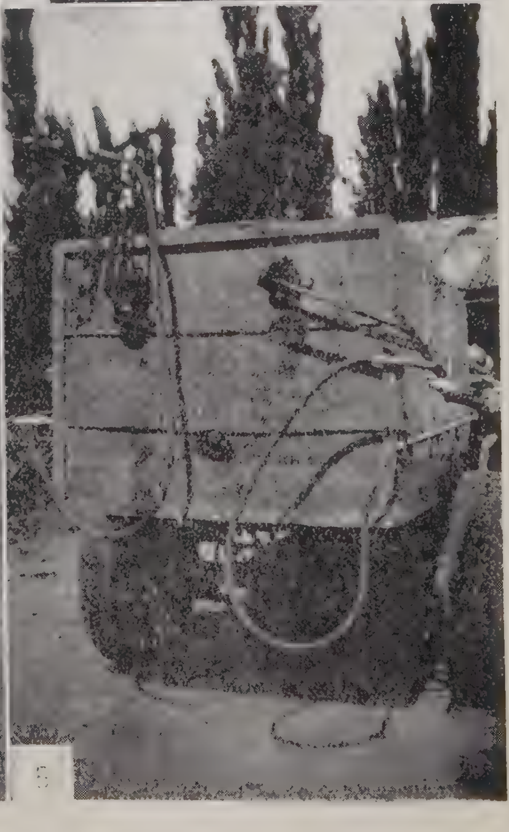
ADVICE has been received from the Ministry of Supply that owing to the uncertainty of the supply position for both car and truck tyres over the next few months, it is imperative that existing stocks be conserved to the utmost to carry the country over a period which, in all probability, will be the most difficult it has been called upon to face. This has been brought about through a world-wide shortage of carbon black, an essential ingredient in the manufacture of tyres, and has necessitated a severe restriction on new tyre issues. Only the bare minimum of essential cases can therefore be considered for new tyres.





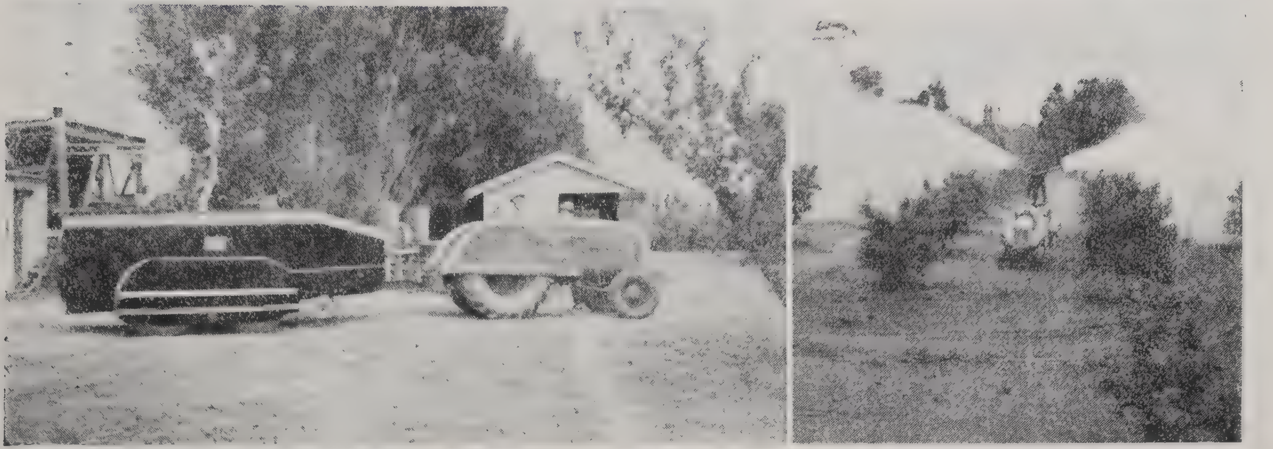






1. General view of first type mentioned in article on opposite page. 2. Same outfit in operation. 3. Third type of oufit. 4. Pump and pump power unit of third type. 5. Rear view of third outfit.

"Crawler" Spray Outfits in Hawke's Bay



Above, left—Factory-built outfit. Right, the outfit in operation.

IN recent years considerable innovations have taken place in the system of spraying practices in Hawke's Bay orchards, due largely to labour difficulties and to a certain extent to the general desire to obviate as far as possible the arduous nature of spraying. Until five years ago the piping system was very popular, most of the larger and more up-to-date orchards being so equipped. During that period, however, owing to the reasons mentioned above and also to the inherent disadvantages of the piping system, there has been a general trend towards what is commonly called the "crawler" outfit. There has been a corresponding decrease in the number of portable outfits in use; some of these being converted and others scrapped and "crawler" outfits substituted.

SOME crawler outfits are factory made, but by far the greater number are made locally by engineering firms to growers' specifications. Of these there are three types; two fairly well known and one a more revolutionary type of which there is at present only one in the district. All three types embody the same principle, that is, the operators ride on the outfit and spray the trees, using high-pressure and large-volume delivery from 6- to 8-nozzle "brooms," while moving slowly along between two rows of trees, one side of each tree being sprayed as the outfit passes. This operation is repeated between each row.

Of the first two the one that has the same power unit for both traction and working of spray pump is very popular. Whether this power unit is a tractor with a power take-off to the pump, or a truck engine and chassis with pump, suitable gear reductions, and tank fitted, matters little; the principle is the same, and provided the pump capacity and gear reductions are correct and the operators are efficient, results have proved to be as efficient as with the older, more orthodox ways of spraying.

The other type of the first two mentioned above is the one where two power units are used, one for traction and one to deliver power to the pump. There may be a disadvantage with this type as compared with the previous one in that two engines have to be serviced instead of one, with an increase in fuel consumption, but it has the advantage that the rate of travel can be varied without altering the speed of the pump. This can become a very real advantage with trees of varying size in the same row.

Tank capacities for these two types vary from 300 to 800 gallons, and pump capacities from 18 g.p.m. to 35 g.p.m. It should be noted, however, that the 18 g.p.m. has hardly sufficient volume delivery for this type of work. Three operators are required, one to drive and two to operate the "brooms" from a platform at the rear or on top of the spray tank.

The third type mentioned previously has been built at Mangateretere by a man who has been working on the outfit for the past two years and at present has it practically completed. One operator only is required to man this outfit, as against three in the normal crawler type. The work of the other two operators is done mechanically, controlled from the driver's seat. The two 6-nozzle brooms, one attached to each side of the back of the outfit, are worked by power from the motor, moving vertically through an arc of from 45° to 135°, according to the height of the tree being sprayed. This outfit has not yet been thoroughly tested, but should it prove satisfactory it will indeed be an advance in the technique of spray application.

As an indication of the saving in time and conservation of man energy of the two first-mentioned types of outfit, the following figures are of interest. An orchard of 55 acres when piped took 7 men 6 days to spray. With the crawler type outfit it takes 3 men 3½ days, the 3 men riding on the outfit the whole time. This constitutes a saving on one orchard alone of 31½ man days per spray. Very careful checks have been made to ascertain whether coverage is complete. Subject to the human element, correct mechanical construction, and adequate volume delivery, as good if not better results have been obtained when compared with that done by the man on the ground walking around the tree.

A survey of 186 growers was recently made and the following figures give an indication of the prevalence of the crawler type.

Crawler outfit ..	53
Piped	66
Portable	67
	186

The portable type is still largely used on the smaller holdings, the majority of these being owned by growers with less than five acres.

—K. C. HOCKEY, *Orchard Instructor, Hastings.*

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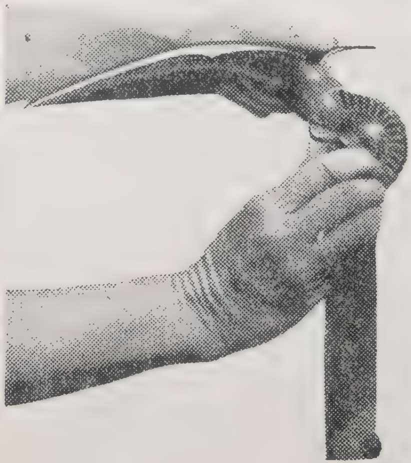

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"I think it is the handiest and best thing that I've ever seen."

"I have found that by using "ALBEE" in my home garden as a chopping hoe, he is easily used, no back-breaking work, and the results achieved are far greater than any I have ever had before—yes, "ALBEE" will do me—I wouldn't dream of using a spade again."

"I am well satisfied with "ALBEE." Its variety of uses make it indispensible. I use it for hoeing the garden, draining, digging rushes, and chopping the weeds of the path, etc. In the garden I hoe up the earth around the plants and keep the weeds down. My crop of maize matured quicker than my neighbours'—some of mine had five good cobs on one stalk against two on my neighbours'."

A woman farmer writes:—

"For post-holes I like "ALBEE" better than a shovel and spade. I have tried him on rushes and find him good there, too; as a grubber of gorse he is a success and as a chopping hoe he's out on his own.

"Having read "Plowman's Folly," I have been using "ALBEE" on my garden,—as was. Recently there was a dense growth of paspalum, scotch thistles, docks, blackberry, white clover, and brown top, up to 3 feet high in places, and a dense mat of half-dead "trash" on the ground. I'd never had the heart to tackle the job with a spade, but just felt like trying "ALBEE" out on something really tough, and he was simply splendid on the job, chopping the vegetation cleanly and working the soil to a depth of four or five inches quite easily."

"Kindly forward by rail to Marton 1 "ALBEE"—have heard so much about this very useful tool."

"ALBEE" is out on its own."

"This morning I used my "ALBEE" on deepening a drain in a peat swamp. Well, I am writing to tell you that I wish I had one years ago. I did an estimated day's work in one-third of a day. "ALBEE" is just as great, too, for digging post holes. The hole does not have to be as big as when using an ordinary shovel. This is the first testimonial I have written in 13 years of farming."

I've still got a few copies of "Plowman's Folly" by Ed. Faulkner, and my book "The Awakening." Every farmer and home gardener should read both of these. Convenient order coupons are attached.

Already this year my sales of "BEVIN" Harrows have reached an all-time record—the coupon will bring you full particulars.

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Send.........."ALBEES" at 25/- each.

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INTERNAL PARASITES OF SHEEP

Internal parasites of sheep are responsible for heavy loss, much of which is unrecognised, because even where death or definite disease symptoms are absent animals may fail to make optimum weight gains and may take weeks longer to fatten. In the case of ewes a reduction in the milk yield would be reflected in the growth rate of the lambs at foot. All sheep harbour some parasites, and under good conditions small or moderate numbers produce no significant damage, but when they increase beyond a certain level failure to grow normally, later loss of weight, obvious disease, or death results.

By
L. K. WHITTEN,
Parasitologist,
Animal Research Station,
Wallaceville.

THE internal parasites of sheep belong to three groups, flukes, tapeworms, and round worms. The liver fluke, which occurs in the bile ducts of the liver, is restricted in its distribution to Hawke's Bay, Central Otago, and the Nelson Province, and will be dealt with separately.

Life Cycles

The more important parasites of sheep, which belong to the group known as roundworms or nematodes, live in the fourth stomach, small or large intestines, or the lungs. The females lay large numbers of eggs, which eventually pass out in the droppings and hatch under suitable conditions of warmth and moisture; the contained larva escapes, undergoes two moults, and after a week or 10 days reaches the stage at which it is able to infect sheep if eaten with the pasture. Within the body of the host it grows to maturity in about three weeks and so completes the life cycle.

The life history of the tapeworm involves an intermediate host, a small free-living mite in which eggs from sheep's droppings develop to the infective stage. When infected mites are eaten with pasture the adult tapeworm grows to maturity in the host's intestine.

Symptoms of Infestation

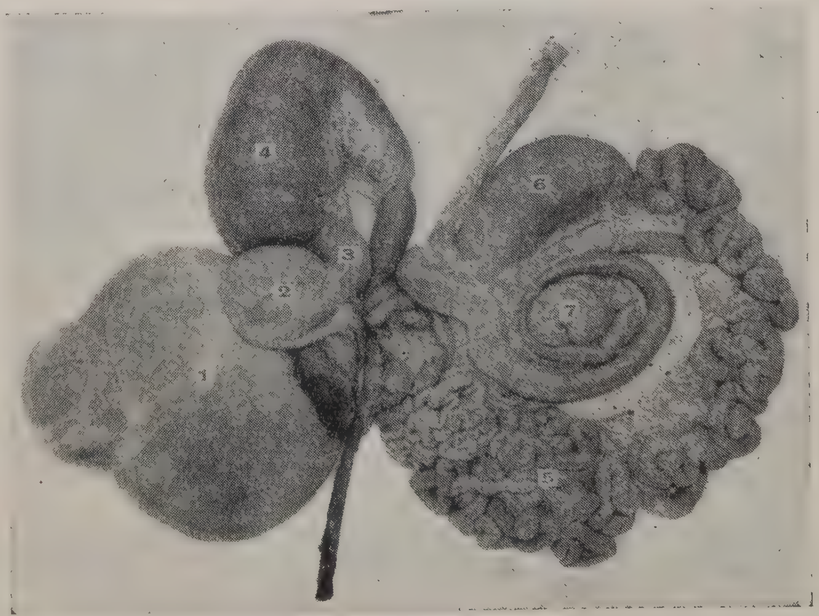
The symptoms which help in making a diagnosis are, primarily, failure to make normal weight gains; in more severe cases actual losses in weight occur. Scouring is usually present in heavily-parasitised sheep, but sometimes wormy sheep may be rather constipated. The severe watery scour so characteristic of heavy infestations with small intestinal worms produces marked soiling of the hind quarters, hence the common name of "black scours" for this disease. Affected sheep lose their appetites, become sluggish and depressed, and will lag behind the rest of the mob if they are driven any distance. The wool becomes harsh and loses its bloom and healthy appearance. An anaemia may or may not be present; it can be detected by examining the lining of the eyelids and mouth, or the skin, all of which normally are a healthy pink colour, but in anaemic sheep, such as those suffering from heavy infestations with the blood-sucking large stomach worm, may be pale and watery, or, in severe cases, absolutely white and bloodless.

Post-mortem Examination

The information that one can gain from a post-mortem examination is of great value in making a diagnosis; in fact, it is the only method by which a definite diagnosis can be made in the field. Without some experience the smaller species, among which, however, are some of the most harmful, may be overlooked even when present in very large numbers.

To determine roughly the intensity of the infestation the fourth stomach should be slit open and the contents carefully examined in a good light; if any number of the **large stomach worms** are present their active movements in the stomach contents, provided this is still warm, should be readily detected. An infestation of more than 1000 of this species may be considered as harmful. **Medium stomach worms** will be found adhering closely to the wall of the stomach. They are often almost covered with mucus, which should be scraped away with a knife to make this small, brown, hair-like worm more easily seen. They occur in greater numbers towards the narrow posterior end of the stomach. Infestations of 8000-10,000 are sufficient to cause the death of a lamb.

The **small intestinal worms** are usually confined to the first half of the small intestine. The intestine should be taken at the point where it leaves the stomach and stripped away from its surrounding folds of peritoneum for about 20-30 ft. A small sample of the contents can be removed and



Gastro-intestinal tract of the sheep after removal from the carcass. 1. Rumen or paunch; 2. Reticulum or honeycomb; 3. Omasum or bible; 4. Abomasum or fourth stomach; 5. Small intestine or runners; 6. Caecum or blind gut; 7. Colon or crown.

examined, diluted with water in a shallow glass dish or wide-mouthed bottle, when any worms present will be rendered more easily visible. The gut can then be slit open and 2 in. lengths examined by stretching between the thumb and forefinger of each hand and holding it up to the light, when the delicate parasites can be seen as fine red threads adhering to the wall of the gut. The small intestinal worm is the one which is responsible for much of the winter hogget unthriftiness and a count of more than 10,000-20,000 should be considered dangerous.

Tapeworms are also found in the small intestine. They are white, ribbon-like worms up to 18 ft. long and about half an inch wide. Short chains or individual segments, which resemble rice grains, are shed from time to time, and sometimes may be seen in the droppings of infected sheep. Tapeworms are more common in lambs than adult sheep, but as very heavy infestations can occur in perfectly healthy animals, the finding of a number on post-mortem examination should not cause any undue concern.

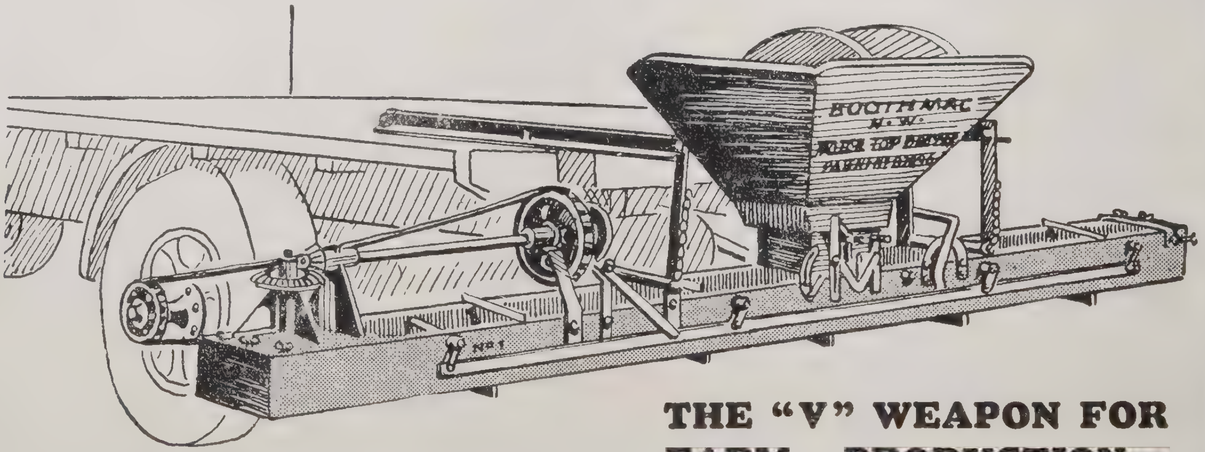
In an examination of the large intestines it is necessary only to include the caecum and the colon as far as the end of the coiled portion or "crown"; it is unusual to find parasites further back than this. When the large intestine is slit open the parasites can be seen quite well with the naked eye. The presence of 100-200 large bowel parasites would constitute a heavy infestation.

An examination for lungworm, which should be suspected when areas of consolidation are present in the lung or when coughing is a marked symptom, can be made by slitting open the bronchi from the point where they divide to within an inch of the basal border of the lung, or, alternatively, by cutting across the main lobes of the lung an inch or two from the border and examining the cut ends of the air passages where it should be possible to see any lungworms present with the naked eye.

The size and appearance of the various parasites can be seen from the photographs.

Specimens for Diagnosis

If specimens are to be taken for dispatch to the laboratory for an accurate



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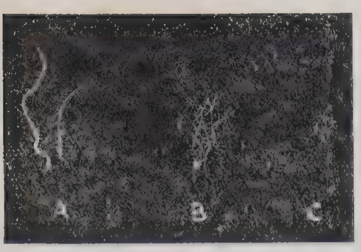
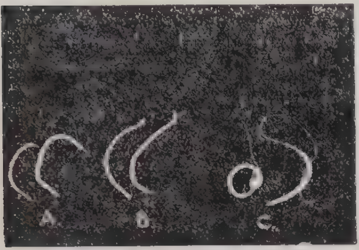
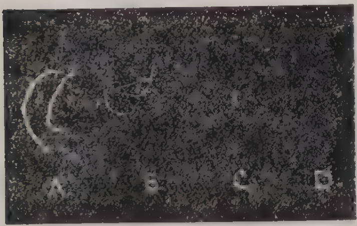


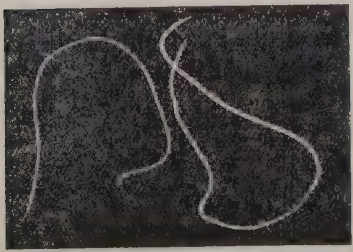
Parasites of the fourth stomach (natural size). A. Large stomach worm *(Haemonchus contortus)*; B. medium stomach worm *(Ostertagia circumcincta)*; C. Small stomach worm *(Trichostrongylus* spp.).



Parasites of the large intestine (natural size). A. *Oesophagostomum venulosum;* B. Large-mouthed bowel worm *(Chabertia ovina)*; C. Whipworm *(Trichuris ovis)*.



Parasites of the small intestine (natural size). A. Hookworm *(Bunostomum trigonocephalum)*; B. Thin-necked intestinal worm *(Nematodirus* spp.); C. *Cooperia curticei;* D. Small intestinal worm *(Trichostrongylus* spp.).



Lungworm *(Dictyocaulus filaria)*. (Natural size.)

determination of the numbers present, one of the following procedures should be followed. After the organs are removed from the carcase pieces of string should be tied around both ends of the fourth stomach, the small intestine just before it enters the caecum, and the rectum. The first and second stomachs may then be discarded, but if the third stomach is left attached to the fourth, there is less likelihood of the string on the latter slipping. The viscera may then be placed in a tin provided with a press-in lid. It should be not more than two-thirds full and an ounce of chloroform or a quart of 5 per cent. formalin poured over the organs will prevent fermentation. The lid should be put on immediately and forwarded to the Chief Diagnostic Officer, Animal Research Station, Wallaceville, as quickly as possible.

An alternative method is to place the fourth stomach and contents in one or more screw-top jars, the first part of the small intestine and its contents in another; a teaspoonful of chloroform or strong formalin should be added to each and the jars sent to the laboratory. The large intestines and lungs should be examined in the field, and if large numbers of parasites are present they, too, may be placed in jars and railed to Wallaceville. If individual worms are to be forwarded for identification they should be preserved in 5 per cent. formalin or methylated spirits in a small bottle, and labelled fully with the name and address of the owner, the animal, and the organs from which they were collected.

Treatment

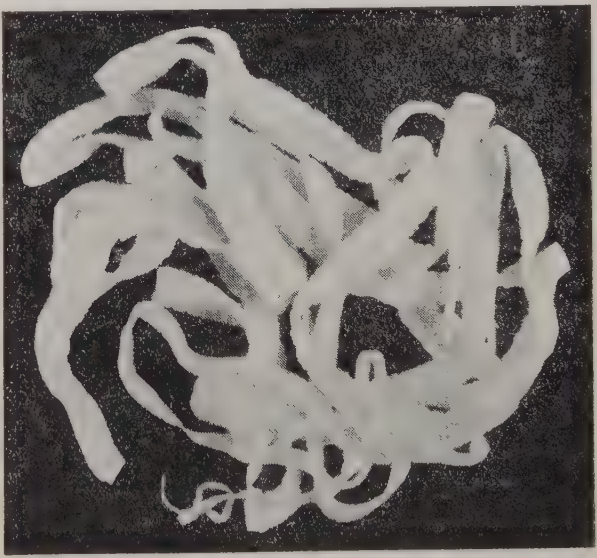
The mixture most commonly used for drenching sheep for intestinal parasites is bluestone and nicotine sulphate. This may be given in solutions of 2 per cent., 4 per cent., or 5 per cent., but it is probably more convenient to use a 2 per cent. solution for lambs and hoggets and a 4 per cent. solution for ewes. The mixture can be made up by adding bluestone to water, preferably a little warm water to dissolve it first, and then adding 40 per cent. nicotine sulphate in the following proportions, using copper, glass, enamel, earthenware, or wooden vessels. Iron, tin, or zinc would be corroded by the copper sulphate.

The mixture will keep indefinitely if containers are well stoppered to prevent evaporation.

	2 per cent.		4 per cent.	5 per cent.
Bluestone	1lb.		1lb.	1lb.
Nicotine sulphate	16 fl. oz.		16 fl. oz.	16 fl. oz.
Water	5 gals.		2½ gals.	2 gals.
		DOSAGE.		
Adults	2 fl. oz.	(60 c.c.)	1 fl. oz. (60 c.c.)	24 c.c.
2-tooths (12-18 months)	1½ ,, ,,	(45 c.c.)	¾ fl. oz. (25 c.c.)	20 c.c.
Lambs (8-12 months)	1 ,, ,,	(30 c.c.)	½ fl. oz. (15 c.c.)	12 c.c.
Lambs (4-8 months)	¾ ,, ,,	(25 c.c.)	—	—
Lambs (under 4 months)	½ ,, ,,	(15 c.c.)	—	—

If lambs are very weak they should be given the dose recommended for the next lower age group, and it should be repeated in 10 days. There is no necessity to starve sheep before or after treatment. As a routine procedure lambs should be drenched every three or four weeks, but during an outbreak of parasitic disease the dosing may be repeated every 14 days, returning to the longer interval as improvement takes place.

Where trouble is experienced annually ewes should be drenched once or twice before lambing, and lambs at weaning or even before weaning if conditions are favourable for infestation. Drenching should be continued throughout the autumn and winter months, but may cease with the appearance of the spring growth.



Tapeworm *(Moniezia expansa)*. (Natural size.)

One drench for all stock

PREMIER PRODUCTS NEW

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—7% STRONGER, MORE EFFICIENT PHENOTHIAZINE DRENCH FOR THE WAR ON WORMS.

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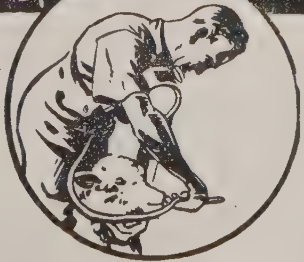
AGAIN AVAILABLE, ELLIOTTS DRENCHING PISTOLS AND AUTOMATIC GUNS, with Elliotts Pistol Drencher and Phenzeen nozzle.



ELLIOTTS AUTOMATIC DRENCHING GUN—£6/15/-—complete with container, rubber tubing, straps, cock and carrying case. Dose Range, 5 c.c. to 1 fluid oz.

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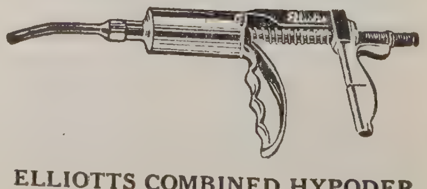
ELLIOTTS DRENCHING PISTOL: £1/19/6 (as illustrated). Dose Range, 5 c.c. to 1 fluid oz.



ELLIOTTS COMBINED HYPODERMIC & DRENCHING SYRINGE: 35/-. Dose range 2½ c.c. to 10 c.c.

Phenothiazine

In recent years this new drug has become increasingly popular in the treatment of parasitic infestations in farm animals. It is more effective than bluestone and nicotine sulphate, but because of its higher cost and the fact that it is more difficult to administer it may be necessary to confine its use to valuable stud animals or to cases where sheep fail to respond to the bluestone and nicotine mixture. Phenothiazine is an insoluble powder and consequently is best given in the form of a suspension or a thin paste. It can be given through a syringe type of drenching gun, but it will clog the valves of automatic guns. It can be drenched from one of the old-fashioned drenching funnels, but a more fluid suspension is necessary with the funnel than with the drenching gun. Suspensions must be stirred constantly during dosing or the powder will be deposited and the doses given will not be accurate. Efforts should be made to avoid unnecessary soiling of the wool with the drug, as this will produce a deep purplish stain. It may be advisable to wipe any excess from the funnel with a cloth before the animal is dosed to reduce such staining to a minimum.

After sheep have been dosed with phenothiazine portion of the dose is oxidised in the body and excreted in the form of a red dye in the urine. This may stain the wool a deep red colour, which, unfortunately, will not scour out. Under normal circumstances the amount of staining is negligible, but it is advisable to avoid keeping animals in yards for more than an hour or so after dosing so that unnecessary staining due to overcrowding in the yards can be avoided.

Phenothiazine suspensions may be kept indefinitely if the containers are air-tight so that loss of water cannot occur.

The following figures for the number of doses per pound may prove useful when ordering or mixing phenothiazine.

15 gm. doses	30 per lb.
20 gm. doses	23 per lb.
25 gm. doses	18 per lb.

Suspensions of phenothiazine can be prepared as follows:—

	Thick Suspension. (½ gm. per c.c.)	Thin Suspension. (¼ gm. per c.c.)
Phenothiazine	1lb.	1lb.
Water	16 fl. oz. (450 c.c.)	2¼ pints (1,250 c.c.)
Or make up to total volume of	1½ pints (800 c.c.)	3 pints (1,600 c.c.)

DOSAGE.

	Powder.	Thick Suspension.	Thin Suspension.
Adults	25 gms.	1½ fl. oz. (45 c.c.)	3 fl. oz. (90 c.c.)
Lambs, 5-12 months	20 gms.	1¼ fl. oz. (35 c.c.)	2½ fl. oz. (70 c.c.)
Lambs under 5 months	15 gms.	1 fl. oz. (28 c.c.)	2 fl. oz. (55 c.c.)

Carbon Tetrachloride and Tetrachlorethylene

The former of these two drugs has been used quite extensively for treating sheep, but it is effective only against the liver fluke and the large stomach worm. It cannot be recommended as a routine treatment except where either of these two parasites is the cause of the trouble. Carbon tetrachloride is administered mixed with liquid paraffin in the ratio of 2:3 or 1:4. The doses of the mixtures are:—

	2:3	1:4
Adults	5 c.c.	10 c.c.
Lambs	2½ c.c.	5 c.c.

Carbon tetrachloride is the only drug than can be used against the liver fluke, but as the large stomach worm is usually accompanied by the smaller stomach and intestinal worms, bluestone and nicotine sulphate or phenothiazine should be used.

Tetrachlorethylene is fairly effective against both stomach and intestinal worms, but has the disadvantage that it sometimes produces a marked intoxication, which, alarming though it may be, is rarely fatal if the animals are left alone. The dose rates of a mixture of tetrachlorethylene with equal parts of liquid paraffin are:—

Adults	20 c.c.
Lambs	10 c.c.

Tetrachlorethylene should, for best results, be given a few seconds after a 10 c.c. dose of 5 per cent. bluestone. This is to cause closure of the oesophageal groove so that the drug passes directly to the fourth stomach, as tetrachlorethylene is ineffective when swallowed into the first or second stomachs.

Treatment for Lungworm

Several methods have been devised for treating animals for lungworm, including inhalations of chloroform, or intratracheal injections of various mixtures such as chloroform, creosote, turpentine, and olive oil; however, there has been no definite proof under controlled experimental conditions that any such treatment is effective. The improvement which often follows such attempts at treatment is usually attributable to better nutritional conditions, good nursing, and a reduced intake of infective material that follows a change of pasture. No treatment is recommended other than attention to diet, the removal of stomach and intestinal parasites which generally accompany lungworms, and removal from grossly contaminated pastures.

Prevention

Prevention in parasitic, as in other diseases, is always better than cure. It can be seen from the life histories, briefly described above, that worm parasites are unable to multiply in the host, as do other agents, bacteria, protozoa, or insect parasites of the skin. Each parasite must be picked up individually from the pasture, and so, if the pasture infestation is kept below a certain level, the disease can be prevented. When worm larvae are picked up by a grazing animal only a proportion will develop to maturity, the proportion varying widely between individuals, but under certain conditions, when animals have a lowered vitality from malnutrition or inter-

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current disease, the percentage which develops will be greater, and at the same time a smaller number will be required to produce symptoms of disease.

As lambs up to 12 months, and to a lesser extent pregnant ewes, are the more susceptible animals, the best feed available should be reserved for them. Ewes should lamb in paddocks that have been spelled, lambs should be weaned into clean paddocks, and both ewes and lambs before and after weaning should be moved regularly to fresh pasture. Overstocking, which leads to heavy contamination, patchy grazing, and under-nutrition, should be avoided. Other stock such as horses or cattle should be used where possible on sheep pastures, as most sheep parasites fail to mature in these animals.

As parasitic infestation is most likely to occur in lambs from November to July and in breeding ewes from August to November, sheep should be watched closely during these periods, as the chances of recovery are better if curative and preventive measures are applied before the disease has progressed too far.

Control Measures

In many districts in New Zealand an elaborate routine of parasite control is uneconomic. In much of the high country mustering difficulties are so great that regular drenching is impracticable, and in any case lambs raised in such an environment, with low stocking rates, seldom become heavily parasitised.

Under the dry conditions that occur over much of the Canterbury plains and foothills, regular drenching may produce a slight increase in body weight, but often this is not sufficient to pay for the cost of the necessary drugs and labour. One drench at weaning time and possibly another a month later may be adequate. In abnormally wet summers, with repeated rains in November and December, conditions will occur which favour the development of parasitic disease, and in such a season drenching should commence before weaning and be continued throughout the summer and autumn months to mid-winter.

Grown crops are usually very clean and lambs fattened on rape or lupins rarely acquire heavy infestations, especially if the crops are fed off in breaks, lambs are not allowed over areas already grazed, and heavily-contaminated run-off pastures are avoided. Lambs, however, may be heavily infected before going on to the fattening crops, and drenching once or twice is recommended to rid them of the parasites which would otherwise check their rate of fattening.

Fat lamb breeders, who succeed in drafting a large percentage of their lamb crop into the freezing works early in the season, seldom experience parasitic trouble, which tends to be more in evidence later in the autumn. The lambs carried over, however, may become heavily parasitised.

In the North Island and in wetter areas of the South Island parasitism in lambs and hoggets is experienced annually. Drenching should begin at weaning time and continue until mid-winter. Rotational grazing should be practised and new pasture or spelled paddocks should be reserved for lambs. Where hill pastures and fertile flats are available and where experience has shown that lambs fail to thrive in the late summer and autumn hill pastures should be utilised for lambs and hoggets and the flats for older sheep and cattle.

When regular treatment of the entire lamb flock is impracticable or unnecessary it is frequently satisfactory to draft off the tail-end of unthrifty lambs and, if these are run separately, special drenching and feeding treatment can be given to them. Leaving such heavily-infected lambs in a small hospital paddock which may become very heavily contaminated is to be avoided.

It is usually unnecessary to drench sheep other than lambs, hoggets, and pregnant or lactating ewes, since wethers and dry ewes are practically immune to parasitic diseases, with the possible exceptions of large stomach worm and the liver fluke infestations.

Illustrations are from photographs by A. L. Bryant.

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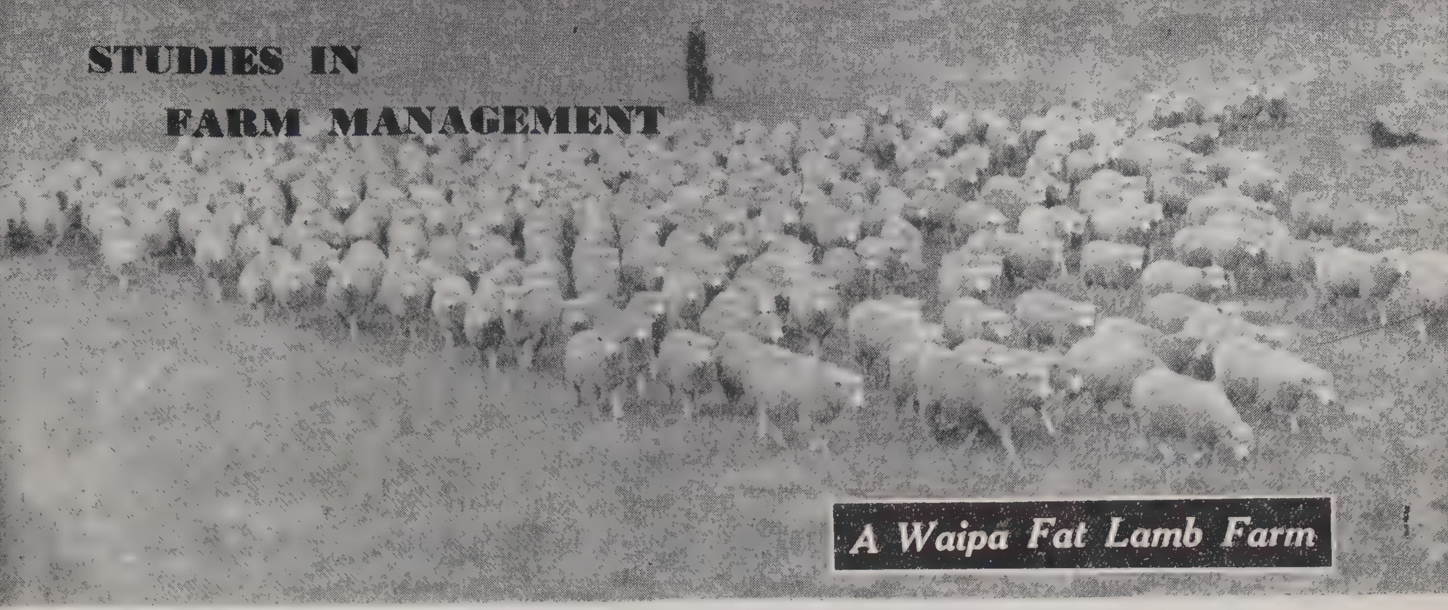


STUDIES IN FARM MANAGEMENT

A Waipa Fat Lamb Farm

THE Waikato is an intensively-farmed pastoral area devoted to dairying and fat stock production. This article describes the general farming conditions in the Hamilton Basin and details the farm management practices on a fat lamb farm in Waipa County, situated in the northern portion of the basin.

By
A. T. SHANNON,
Field Economist, Hamilton.

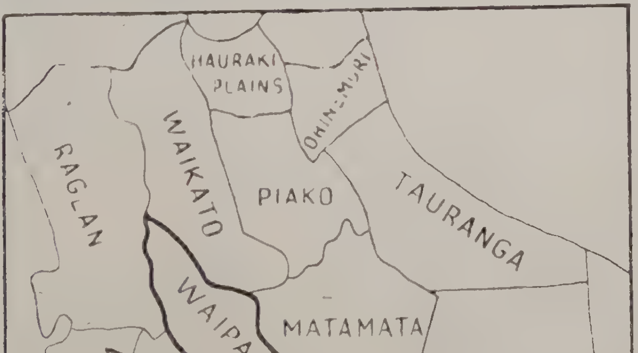
THE highly productive farming areas of the Waikato and Thames Valley comprising the Hamilton Basin and the Hauraki lowland incorporate roughly the counties of Waikato, Waipa, Hauraki Plains, Piako, and the north-western half of Matamata, together with a portion of northern Otorohanga. The relative importance of these lowlands in New Zealand's farming economy can be seen from the fact that while they account for only 5 per cent. of the total area sown in grass, about 20 per cent. of the Dominion's dairy cows are carried, nearly 10 per cent. of the cattle other than dairy cows, and 3 per cent. of the total sheep shorn. Further, one-fifth of the 400,000 acres cut for hay in New Zealand and one-third of the 56,000 acres cut for ensilage are similarly accounted for as part of the grassland farming.

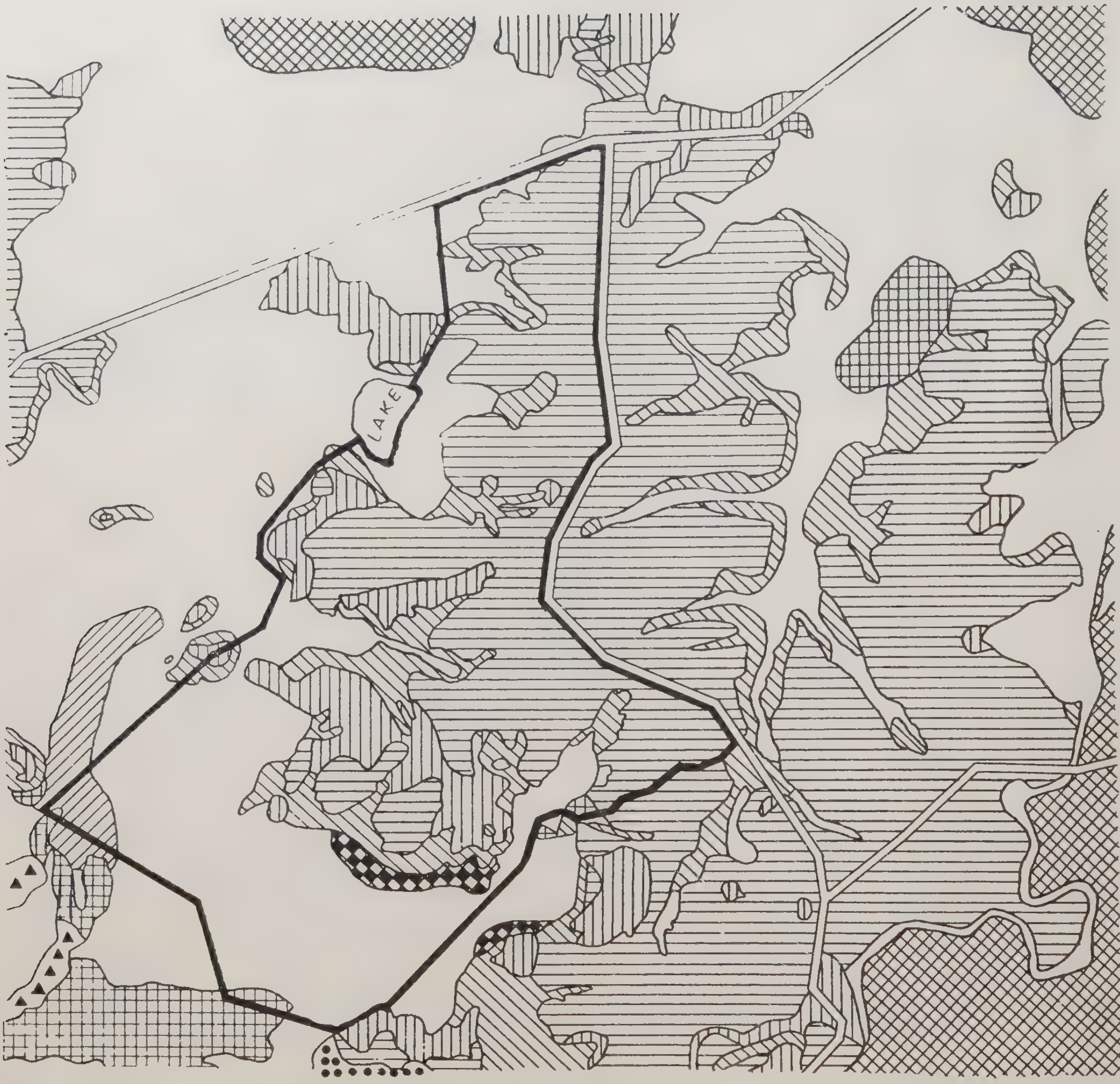
As a whole, the area is flat to undulating, but exhibits a diversity of soil types of varying origins, though the commonest are derived from volcanic ash showers and peat swamps. The plains have at one time or another been the playground of the Waikato River, which alternately sought various parts of the Firth of Thames and the west coast to discharge into the sea, meanwhile forming alluvial flats or banking up swamps in the changeable course of its career in the lowland area. Consequently, the soils of the wide plains are sands and loams derived from pumice sand deposited by the river, and constitute the major part of the farmed land. The peat areas, being of low fertility and difficult to handle, are largely unoccupied. Bordering the lowlands on the west is a low watershed, mostly under 1,000ft. but rising to 3,000ft. in the peak of Pirongia at the south-western corner of the area, while on the east the principal feature is the Kaimai Range extending roughly from Mamaku in the south (on the edge of the central plateau commonly referred to as the pumice land) to beyond Te Aroha Mountain, 3,000ft., in the north.

Even in the lowland area itself remnant hills rise to several hundred feet, so that the "pure" dairying land on the flat edges into sheep and cattle country. This aspect of the Waikato farming, while not the most important, is an essential part of the economy of the area, and is frequently under-estimated in giving a general impression of the Waikato.

Early attempts at extensive farming, especially in the Thames Valley, were not an unqualified success; nor were the smaller sections in the Waikato and Waipa Counties, which had been parcelled out in 50-acre blocks to ex-Maori War militia men. Experience has shown that topdressing and intensive farming methods can turn the light pumice lands into high-class pasture.

Actually, the common sizes of dairy farms fall in three groups, one-man blocks of about 60 acres carrying up to 40 cows, two-man farms of 70 to 100 acres with 60 to 80 cows, and larger areas which may amount to two-unit farms. Except on peat soils, the carrying capacity on dairy farms is about a cow to 1½ acres, with variations according to soil type and management efficiency. In the case





Location of Farm edged with a heavy border.

BROWN PODSOLIZED SOIL

Hamilton clay loam .... ▥ *Ohaupo silt loam* .... ▤

MEADOW SOIL

Te Kowhai silt loam, clay loam etc ... ⁙ *Ngaroto sandy loam* ..... ▲

Rotokauri clay loam & silt loam ... ▧ *Te Rapa peaty sand & peaty loam* ▦

Te Rapa peaty sandy loam on iron pan .... ▨

PEAT SOIL

Kaipaki peaty clay .... ▚ *Rukuhia peat* .... ▩

Kaipaki loamy peat, sandy peat, peaty loam, and peaty sand .... □

of land devoted to fat lamb production, a common size of farm is from 300 to 400 acres, again with wide variations.

Climate

Meteorological information from recordings taken over many years at Hamilton give a good representation of the general climatic conditions, though, of course, rainfall is heavier near the hills and frosts are lighter in the Thames coastal district.

Mean Rainfall at Hamilton Over 39 Years.

Month.	Inches.	Month.	Inches.
Jan.	3.6	July	5.2
Feb.	3.3	Aug.	4.1
March	3.4	Sept.	4.1
April	4.0	Oct.	4.4
May	4.7	Nov.	4.0
June	5.0	Dec.	3.5
Total			49.2

This table gives a monthly average of 3.5 inches in the dry season from December to March, rising to 5 inches in the wet winter months. At the same time the lowest recorded rainfall at 29 inches shows that nothing in the way of an actual drought is likely to occur. On the other hand, ground frost, though rare from November to March, may occur in any month except January, especially in low-lying level areas, much to the disgust of maize growers, with recordings up to 15 degrees being not at all uncommon in July.

STOCK AND PASTURE.

Of the Waikato lowlands, the Waipa County affords some typical examples of farm management, covering as it does an area between the Waikato River and its tributary the Waipa, with the Puniu on the south border. The following figures give an indication of the importance of the county from a pastoral viewpoint (1942-43 statistics):—

	Acres.
Total area under occupation	216,913
Area sown in grasses	175,915
Area cut for hay	18,012
Area cut for ensilage	4,449
Lucerne cut	940
Number of holdings	1,610

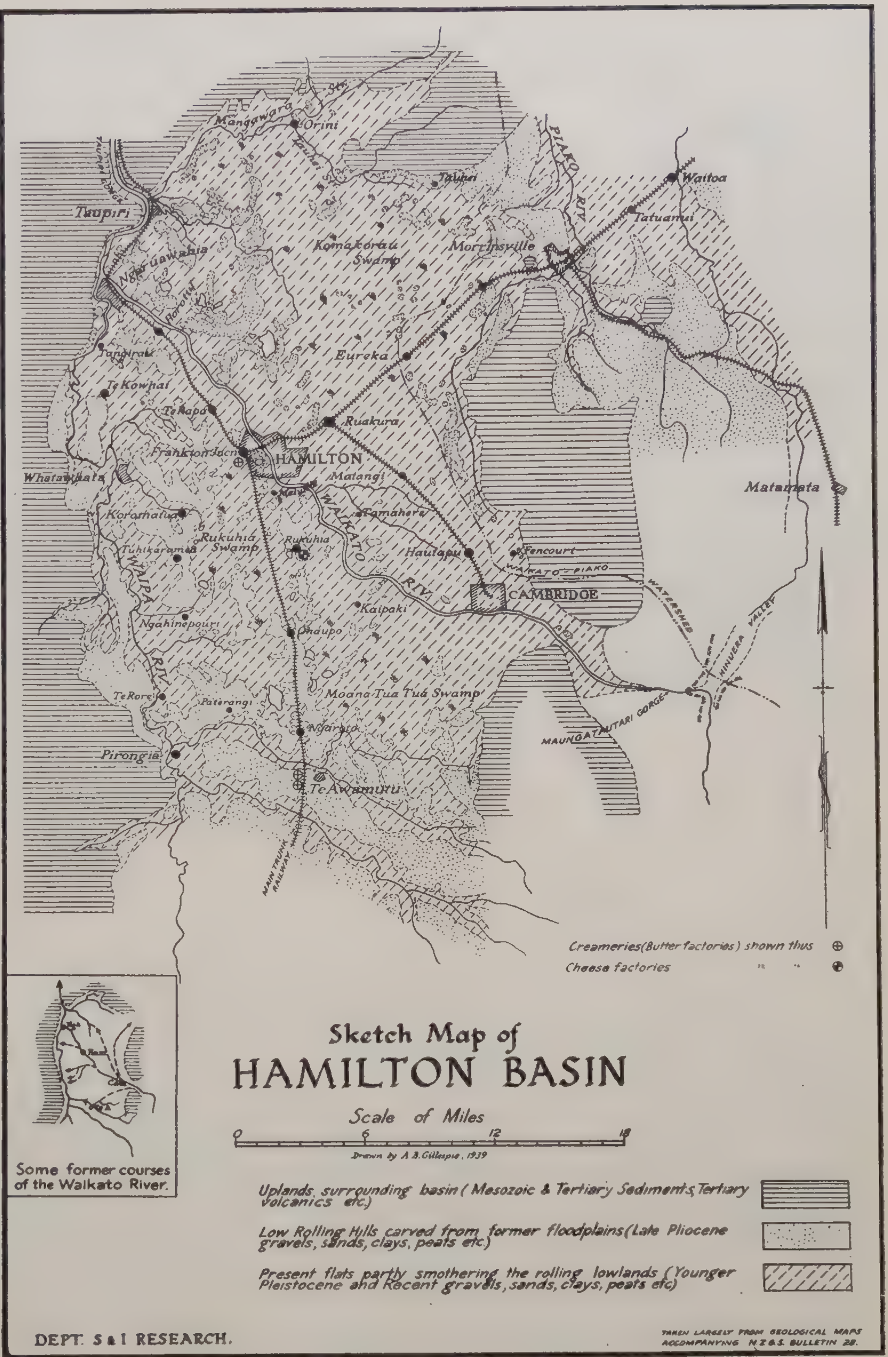
Of a total crop area of 3,678 acres, 3,000 acres were accounted for by swedes and turnips, the remainder being mainly oats 200 acres and maize 300 acres, principally for greenfeed.

The stock position is:—

Dairy cows in milk	70,237
Other cattle	46,536
Sheep shorn	183,158
Lambs tailed	166,600
Sows, 1 yr. and over	3,586

The figure for "other cattle" is somewhat indefinite, including replacement dairy stock not in milk and dairy bulls, but it does indicate the considerable number of fattening cattle carried. The stock position is interesting because of the systems of animal husbandry in the Waikato. The fat lamb and cattle fattening farms of the lower lands are coordinated with the larger grazing runs on the surface-sown hill country, which provide surplus ewes, store lambs and cattle for fattening. With the extension of intensive farming the fattener has had to look further afield for his requirements. This demand has resulted in an annual exodus of culled stock by rail, boat, and on foot from the hill country on the east coast which has been profitable to both vendor and purchaser. So extensive is this trade that in recent normal seasons the stock firms have brought over between 200,000 to 250,000 sheep, comprising about 20,000 wethers, 30,000 2-tooth ewes and the balance four and five-year-old ewes. In addition, more than 40,000 cattle come from the same source, roughly half of them breeding cows and heifers, and the rest two, three, and four-year-old bullocks. There are, as well, considerable numbers brought in by private individuals.

Morrinsville is the principal market for the stock, especially from December to March. It may be mentioned in passing that last year, due to an unfavourable season in the Waikato, a large proportion of the stock was



Sketch Map of
HAMILTON BASIN

Mangawara
Orini
Tauhei
Waitoa
Piako Rly.
Taupiri
Tatuanui
Ngaruawahia
Komakorau Swamp
Morrinsville
Eureka
Te Kowhai
Te Rapa
Ruakura
Frankton Junc.
HAMILTON
Whatawhata
Matangi
Matamata
Koromatua
Tamahere
Rukuhia Swamp
Rukuhia
Tuhikaramea
Hautapu
Fencourt
Waikato-Piako Watershed
Waikato Riv.
CAMBRIDGE
Kaipaki
Ngahinepouri
Ohaupo
Waipa Riv.
Hinuera Valley
Te Rore
Paterangi
Moana Tua Tua Swamp
Ngaroto
Maungatautari Gorge
Pirongia
Te Awamutu
Main Trunk Railway
Creameries (Butter factories) shown thus ⊕
Cheese factories " " ●
Some former courses of the Waikato River.
Scale of Miles
0
6
12
18
Drawn by A. B. Gillespie, 1939
Uplands surrounding basin (Mesozoic & Tertiary Sediments, Tertiary volcanics etc.)
Low Rolling Hills carved from former floodplains (Late Pliocene gravels, sands, clays, peats etc.)
Present flats partly smothering the rolling lowlands (Younger Pleistocene and Recent gravels, sands, clays, peats etc)
DEPT. S & I RESEARCH.
TAKEN LARGELY FROM GEOLOGICAL MAPS ACCOMPANYING N.Z.G.S. BULLETIN 28.

Upper—View of Waipa County. Lower—General view looking towards Pirongia Mountain.

Polled Angus cows and calves.

diverted to the fattening farms in Hawke's Bay, where conditions were much more favourable.

The Waipa County absorbs a proportion of this stock, and pastoral progress over the last 20 years is given in the following figures, emphasising the increase in sheep shorn:

	1922-23.	1932-33.	1942-43.
Cows in milk (as at January 31) ..	35,698	66,016	70,237
Sheep shorn ..	21,638	98,982	198,672
Acres in sown grass	154,460	177,634	175,915
Total cattle	68,553	108,867	116,773

Soil Types

The land of the Waipa consists of low rolling hills, flat areas of alluvial land and large peat swamps, the hills being remnants of an old flood plain covered by volcanic ash showers. The northern soils are clay loams that grow good crops and pastures but may dry out in January and February, while in the south the soils are lighter and less apt to dry. The problem soil of the Waikato is peat, originally in great swamps but now partly drained, in some cases overdrained, adding to its difficulties particularly in the way of initial grassing. The principal soil types are:—

Hamilton clay loam, covering 18,000 acres and mainly 18in. of grey clay loam, on a reddish brown clay subsoil occurs on the rolling hills, where it is the only soil type as far south as Rukuhia. Ohaupo Silt Loam, accounting for 9,000 acres and the principal soil type on the rolling hills from Rukuhia to Te Awamutu and Otorohanga, is typically 6in. of grey fine crumb silt loam on 6in. brown free silt loam, with a silt loam subsoil.

Horotiu sandy loam, which is usually a grey-brown sandy loam on a gravelly sand subsoil, occupies extensive flats, giving rise to rolling hills, and back from the Waipa and Waikato River terraces. It is located on areas totalling some 15,000 acres. In addition, a subsidiary type termed Horotiu sand and coarse sandy loam covers 4,000 acres from Whatawhata on the Waipa River to Ngahinepouri.

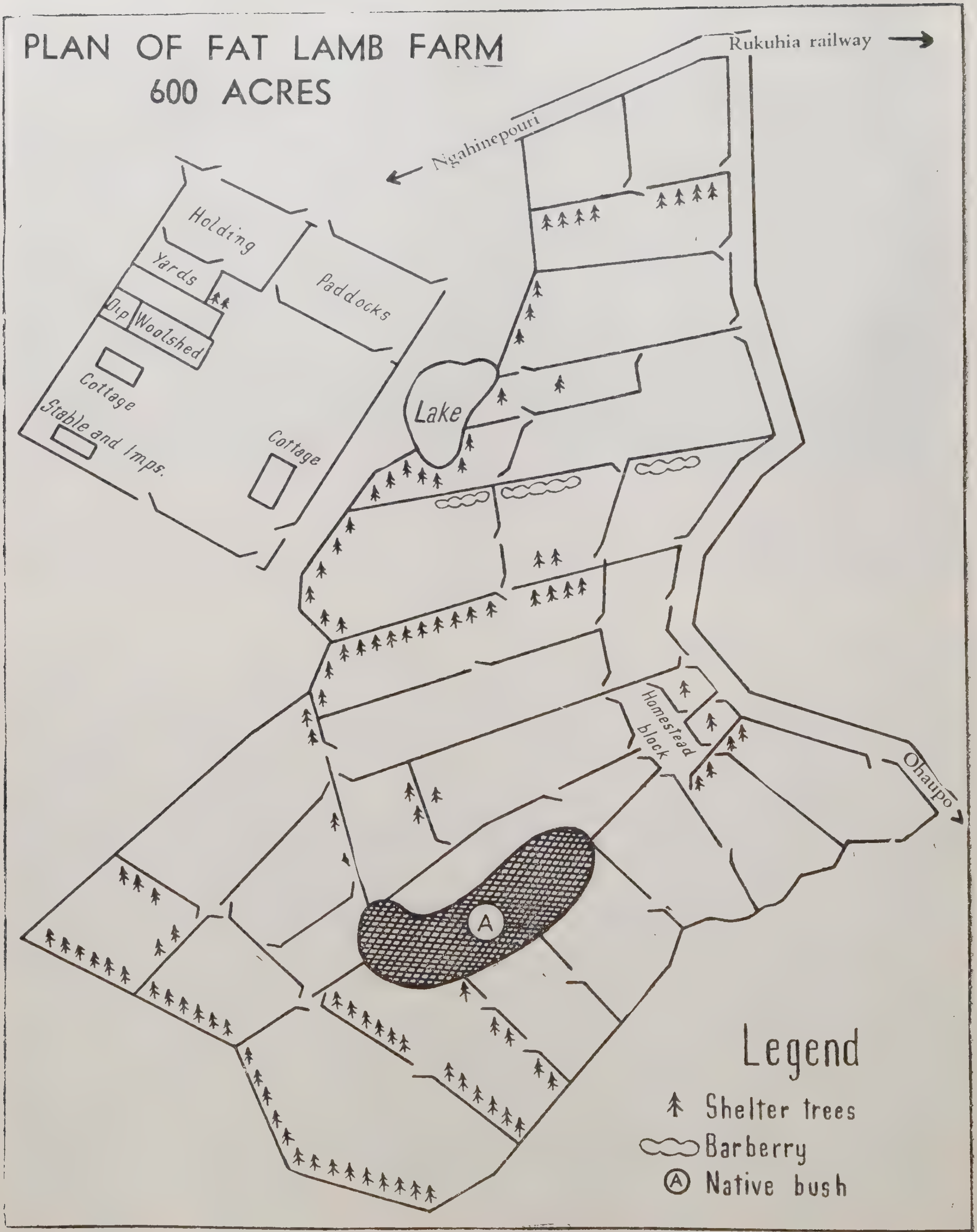
The Whatawhata clay loam, on 8,000 acres, occurs on a belt up to four miles from the Waipa River, and is characterised by pugging in the wet months, which demands careful attention to stocking to preserve the pastures. A further soil type known as the Te Kowhai series is scattered through the district. Covering 6,000 acres and derived from ash deposited by the rivers, it is typically grey, crumbly, clay loam on flecked, white sand subsoil.

In addition, there are various types of swamp peat and peat soils, partly scrub covered, accounting for some 47,000 acres. Quite commonly several types of soil occur on one farm, so that successful husbandry requires a thorough understanding of soil type for cropping and grassland farming.

A WAIPA FAT LAMB FARM.

Typical of a Waikato fat lamb farm and illustrating the importance of efficient management is a 600-acre block comprising 250 acres originally swamp and the balance flat to undulating, situated 10 miles south of Hamilton and 2½ miles from Rukuhia railway station. While this farm at present carries up to 300 cattle, 2,300 breeding ewes and 200 dry sheep, turning off annually about 200 fat cattle, 2,300 lambs, 400 fat ewes, and 66 bales of wool, the picture was very different a few years ago. The story of the development of the farm is valuable because the problems faced are common to much of the Waikato, though the solutions differ with farms and farmers.

The late autumn of 1927 saw the area in five paddocks with broken-down fences, pastures a mass of rat-tail on the rolling country, and the undrained swamp a mass of manuka and blackberry. This uninviting land, with poor buildings but a good homestead, cost £18 per acre, though included on the property was a heavy crop of turnips on 90 acres. Stock



PLAN OF FAT LAMB FARM
600 ACRES

Rukuhia railway
Ngahinepouri
Holding
Yards
Paddocks
Dip
Woolshed
Cottage
Stable and Imps.
Cottage
Lake
Homestead block
Ohaupo
A
Legend
Shelter trees
Barberry
Ⓐ Native bush

Haymaking.

carried that winter were 580 ewes and 51 steers. The turnips proved a saving grace that year, because 2,200 wethers and 3,000 hoggets which were bought in during the period of low winter prices were all fattened and sold by November, netting £1,500. Naturally, it would not be wise to count on such success in every season.

These 90 acres were then grassed, and in addition another 150 acres were cultivated and sown down immediately without first taking a crop. This proved successful, and no cropping has since been done. The same year a further 250 acres of rat-tail pasture were heavily harrowed and topdressed with 4cwt. of superphosphate per acre. This work, done by the owner operating a tractor and the man with a team, raised the winter carrying capacity to 1,200 ewes and 100 cattle, while store steers bought the previous year and sold on a rising market turned out to be a good proposition. The third year saw another 100 acres in new grass and breeding stock at 1,600 ewes and 150 cattle. From then on progress was steady as the pasture area extended and improved and the swamp land came under control.

Breaking in the Land

Until the capabilities of the farm and equipment are learned from experience and a system of breaking in the land is worked out, some of the expenditure on implements and operations is liable to prove none too payable, as many farmers will know. This farm was no exception. Water lying deep on the swamp area in the first winter indicated the lay of a drainage system—the few original drains had gone to rack and ruin—and it required three men working for more than two years doing little more than draining and stumping to put matters right.

It was found that properly constructed manuka drains were the answer to the problem of keeping stock out. The manuka is stacked in the drains at an angle, thick butts down, and covered with rushes and then earth. Consolidation is effected by running the wheels of the tractor up and down until there is no fear of stock going through. Outlets to the main drain are tiled back for a few yards to prevent blocking, so that the only attention required is occasional clearing at this point.

Employing labour to cut and burn scrub on the swamp area turned out to be much more costly than the final method of crushing with the tractor in the dry months of January and February and following with a good burn a week or two later. The subsequent treatment is to give the area two double cuts with giant discs and harrow heavily, first with the heavy flexible harrows to kill the blackberry roots. The more working the seed-bed gets the better the pasture, for the grass is sown down in late February and March. It is claimed that the difference between this method and using the plough instead of discs alone is a slightly less even surface, but a saving of 30/- per acre in costs and equally good pasture.

Sowing to Grass

The practice after preparing the soil is to sow immediately into grass in late February or early March with 24lb. certified perennial ryegrass, 4lb. Italian ryegrass, 6lb. Akaroa cocksfoot, 3lb. white clover, and 3lb. timothy, and superphosphate at 4cwt. per acre. The young grass is grazed in May, thus checking any blackberry regrowth, and again topdressed at the end of winter with a further 2cwt. superphosphate, this bringing a closer sward and a more rapid pasture establishment. Management on this farm is such that no resowing of pastures has so far been felt necessary due to controlled grazing and the annual use in pre-war years of 100 tons or so of phosphates on 550 acres, and latterly, the liming of about one-

●

Wool shed,

Yards

and

Ewe flock.

●

third of the farm each year at 8cwt. to the acre. Extensive harrowing of grass has not brought expected results, so at present only the rough paddocks and the feeding out paddocks, amounting to 100 acres, get a light run over.

Stock Management

To maintain the flock of 2,300 Romney breeding ewes an annual draft of 500 is required. Over a period of seven years these have been procured as two-tooths from the same hill-country station in Gisborne. The more common practice in the Waikato is to buy station sheep in the stockyards, principally Morrinsville, where culled for age ewes are yarded in large numbers from January to March. The majority of these are about five-year-olds, culled for teeth, but very suitable for the soft Waikato grass. As a rule, two-tooths are rejected from station flocks where wool is the principal product because of failure to measure up in this respect, but these same sheep are eminently desirable for low country farms where the object is fat lamb production, and Southdown rams are used on the Romney ewes for that purpose.

"I buy two-tooths partly because the mortality is less than with aged ewes," was the opinion expressed by the farmer. "The lambing rate is lower to start with, but you get better wool and heavier fleeces. With only young sheep coming in I don't have to buy so many replacements each year, so consequently am less liable to losses through striking high market prices. My two-tooths usually cost me 25/- to 30/- landed here, and that's a better proposition than a five-year-old at £1."

The practice of buying from only one source has resulted in a good, even-woolled flock, bringing better returns at the wool sales. "Last year," he remarked, "I bought from a different place, but I'm sorry now." Examination of records over a period of years discloses that ewe mortality has fallen from 8 per cent. to the present level of 6 per cent. (except for the eczema year), as the proportion of two-tooth ewes increased, while the lambing percentage has fallen from 108 per cent. to just over 100 per cent. for the same reason.

After the lambs are got away in December the ewes are held in a few hard-grazed paddocks to prevent them becoming over-fat and then flushed on some of the recovered growth prior to tupping. Following this, they are grazed to keep them in good trim but not to fatten until the approach of lambing. In the meantime, more paddocks are released as cattle are got away fat. At the middle of July the ewes are divided into four mobs of about 600, and each is rotationally grazed through four or five paddocks. When sufficient have lambed, these are left behind in the more distant paddock, which drops out of the rotation. This procedure is repeated, with the lambing coming closer and closer in to the homestead so that shepherding and handling are reduced as time goes on. Moreover, docking can be carried out at the correct time on mobs of lambs all about the same age.

Management with Lambs

"I make it a practice to handle the lambs as little as possible, and they are left with the ewes in the same paddock practically from birth up to the time of getting away fat, the only large-scale handling being at shearing time," says the farmer. "Contrary to common practice, I don't draft my lambs off before shearing. Instead, I hold my forward lambs in small paddocks handy to the shed so that the ewes come straight in for shearing and go out again immediately. It cuts disturbance of the lambs down to a minimum. The more you shift lambs around, the more it upsets their progress. That is why I have only three drafts. Continual yarding to pick out a few fat lambs runs weight off the others, and I don't think it pays to do this. I even do my dagging in temporary yards erected on each paddock. By the way, I work on a 'must get a lamb' principle, leaving the rams out weeks later than is usual, even until June. It means having about 120 late lambs right up in September and October, but I wean them in the last week of February on the best grass and sell them fat when prices are high in May. That's better than carrying an empty ewe.

"Another thing, I never crutch early. I leave it until June, within a month of lambing. If you crutch early there is too much wool on the late lambing ewes. And I don't cull for age alone, but for teeth and constitution. An old ewe of the right kind will make a better job of a lamb than a young one of the wrong sort."

Cull ewes, it may be mentioned, are fattened as soon as possible and fetch about 16/- at the freezing works.

Results

The result of the sheep management as described is apparent from figures representing the normal picture of recent years:—

Drafts of lambs from 2,300 ewes:—	
First draft, mid-December (weights 36-40lb.)	1,450
Second draft, end January	550
Third draft, early March	200
	2,200

This leaves just over 100 lambs not fat off the mothers, principally late lambs as a result of leaving the rams out late. Weaned in February irrespective of age, these are put on to good grass and marketed fat in the Frankton yards at the end of May. In spite of many being undersized, they fetched 21/9 this year. These are the only sheep not sold direct to the freezing works.

"You will notice my lamb weights have been declining towards 36lb.," this farmer pointed out. "That has come with the increase in carrying capacity over a period of years, and has been partly due latterly to the fertiliser rationing, I expect."

Some illuminating records have been kept of lambs born dead or dying within two or three days. These deaths have accounted for

DRENCH EARLIER

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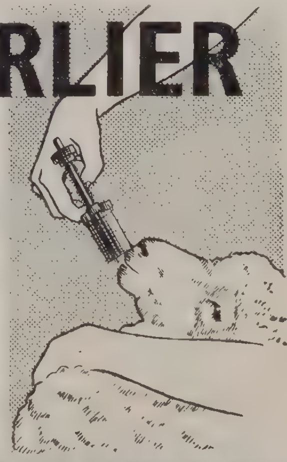

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about 80 until the last few years. Labour shortage principally is described as the reason for an increase of these losses up to around the 100 mark. Losses from docking are now less than a dozen. The emasculator and the searing iron are used now, more than halving the mortality when the knife alone was in use. Speaking of motherless lambs and ewes that have lost their lambs, the farmer remarked, "I mother up more than 100 lambs each year and rarely lose more than six this way. I put the ewe and lamb into a catching pen for a day or so to start with, and in difficult cases tether the ewe to a fence for a while."

Shearing

The farm is blessed with a large wool shed of kauri built many years ago. It has a three-stand shearing plant with a petrol engine, the usual arrangement of catching pens, and plenty of shed room. With the onset of difficulties due to the shortage of shearers, this farmer has been able to bring an expert shearing gang from the East Coast for the job, effecting a considerable saving in time and money as compared with a scratch crew. In addition to three shearers, there are two baling, two at the wool table, a fleece picker, one sweeping and a man penning. Shearing extending over three days costs approximately £75, working out as follows:—

	£	s.	d.
2,500 sheep at 34/- per 100 ..	42	10	0
7 hands at approx. 2/8 per hour for 25 hours	23	10	0
Rations at 6/- per man per day	9	0	0
	£75	0	0

Of course, if wet weather upsets the shearing, costs are liable to be greater, as was the case last year. In conformity with the policy of handling ewes and lambs as little as possible, only dry ewes and rams are shedded at night. Gross wool returns from an average of 66 bales of about 400lb. work out at £1,100 to £1,150, giving a return of over 11d. per lb. and a weight of above 10lb. per fleece. In addition, crutchings bring in £60, these returns being based on war control prices. Lambs are not shorn.

A feature of this farm is the sheep dip, which was constructed several years ago at a material cost of £28 and has stood the test of time. The dip itself is the round type, conical shaped, 9ft. 6in. across at the top, tapered to 5ft. 6in. at the bottom and 6ft. deep, with an exit wide enough to allow two sheep to run at a time and a counter-balanced gate which can be easily operated by hand after the sheep have had their minute in the dip. Advantages claimed for this type of dip over the long straight type are the shorter time taken (1,600 per day or 250 per hour can be dipped), the smaller quantity of dip required, and the fact that, if necessary, one man can operate it in an emergency. With the dip full, the capacity is twelve sheep, and this number is reduced as the depth decreases.

Fat Cattle Production

While sheep are the first consideration on this type of farm, fat cattle production as an adjunct is profitable and essential, first, for pasture control and second, for reasons of maximum economy. The farmer expressed his policy like this—"Once lambing begins the cattle take a very second place until after Christmas. The basis of my cattle production is in my 100 Polled Angus breeding cows, and I have bred up this herd over a period of years by drawing cows from my own stock and bulls from an old-established breeder. Relying entirely on buying is liable to make the game hardly worth while, especially with store steer prices as they have been in the last year or two. My policy now is to buy about 100 to 130 store cattle each year, mainly heifers."

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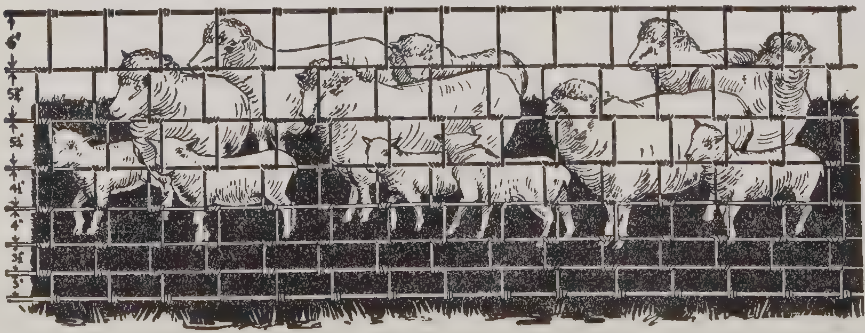

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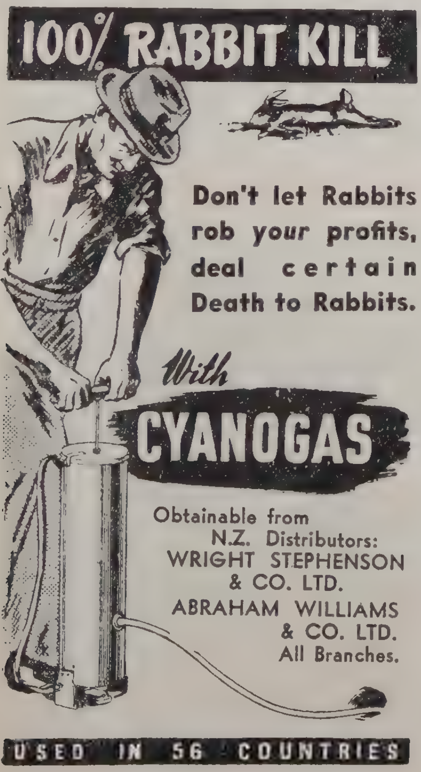
Calving begins in September, going on until mid-November, and the young stock is put on to paddocks that become available as the lambs get away fat. This fits in well in controlling the pasture. At the same time, some grass is held for the time when stock are bought in the dry months of January and February. Marking is completed by the end of November and weaning by late May, when some of the stock are fully eight months old. The choice at this stage is between disposal at high prices or holding to fatten at 20 months to two years, depending on the markets, the weather, and the pocket. The fat cattle fetch about £10 as compared with up to £6 for yearlings.

Breeding v. Buying

Asked to remark on the policy of breeding as compared with buying stores, the farmer remarked, "My own cattle never go through a store period, and at two years old are equal to bought cattle at three years. I used to aim at a gross profit of £3 per head from bought-in steers, but in recent years this hasn't been possible. Latterly I have bought empty two-year Polled Angus heifers, a few cows and steers about February when prices are lower due to the feed shortage in the dry months. But I have been saving grass for this. Remember, I have shut up my ewes on hard grazing to control their condition."



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Speaking about prices, he commented, "I have been able to buy my cattle from £4/5/- to £5/15/-, but on the average market prices have been about £1 dearer over the past two years. My aim is to sell in June-July at £8/10/- to £9 after four months and show a profit of £3. At present it is a struggle to get £2 profit out of bought steers. My own bred cattle go away fat from March on."

Usually only five acres of hay have been made, and no cropping done. This year, however, there is hay from an extra 12 acres for a very special reason. The export price for beef is 30/- to 34/- per 100lb., but for a few weeks in the winter the short supply of fat stock causes the price to rise above this. To hold cattle fat to catch this market the extra feed is necessary, but the extra price makes it worth while. Of course, there is always the chance of missing this top market or of prices not rising sufficiently.

Value of Topdressing

Taking a look around the farm and seeing the land in such great heart, a visitor must ask himself why. The principal reason, as with most of the Waikato, is the liberal use of topdressing, especially in the past years, and proper stock management. In spite of the reduction of phosphates to 50 tons by the rationing, the good results of extensive applications in the past years have maintained the carrying capacity and even increased it slightly. Straight superphosphate used to be applied in the first few years, then basic slag alone, and latterly half superphosphate and half slag, with a dressing of lime as well. The benefit of this, it is claimed, is a more even growth over the whole year. Observed results show that basic slag was instrumental in bringing about a closer sward and, in general, an improved sole of grass.

It is of interest to note that though the farm is adjacent to the Rukuhia swamp, the soil is predominantly Ohaupo silt loam, common on the rolling hills of the district. This soil is described as having an ideal physical condition, and will stand up well to stock trampling. On the low parts of the farm the Kaipaki peaty loam is typical. Supporting blackberry and manuka in its undrained condition, it now carries excellent pasture.

Farm Costs

Principal items in current farm costs vary, and this is true of labour costs in particular. Until the war years this ran into some £600 to keep a married couple and a single man and to employ casual labour. This is, of course, in addition to providing housing and perquisites. Last season, in spite of higher wage rates, the total bill was only £428, as men could not be obtained, though the lower cost does not represent any real saving. The presence of trees on the property and a wise planting policy provide posts and 2,000 battens each year, helping to reduce maintenance costs, which, nevertheless, run into some £250. In addition, fuel for the tractor and an allowance for car costs take up another £100. Finally, there is a rating of £93 annually.

Acknowledgments

Thanks are expressed to the Soil Survey Division of the Department of Scientific and Industrial Research for the data for the soil map and to the Lands and Survey Department for the drawings of the maps.

◆

Internal Parasites of Livestock

CONSIDERABLE economic loss among livestock occurs annually because of the ravages of internal parasites, and it is the duty of every farmer to do his utmost to minimise these losses. The Department's **free** bulletin (No. 189) deals fully with the advantages of phenothiazine in the control of internal parasites. Its effectiveness against the various types of parasites, the methods of administration and the dose rates are fully discussed in this bulletin, which may be obtained from the Department of Agriculture at Auckland, Wellington, Christchurch and Dunedin.

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Seed Analyst, Seed-Testing Station,
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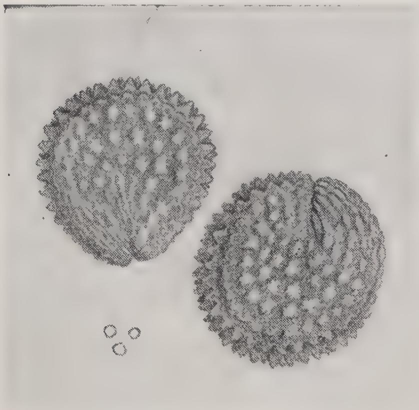
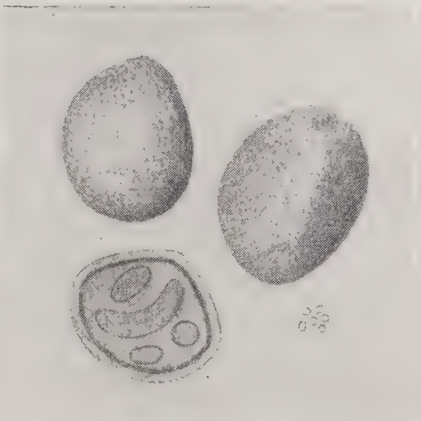
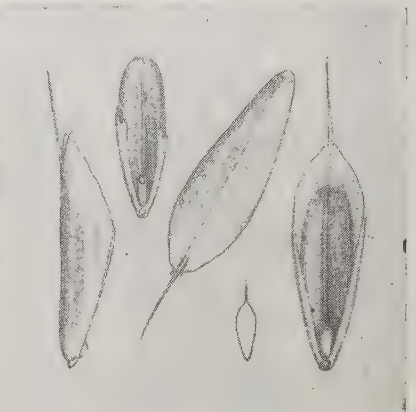
The first of this series of illustrated weed seeds appeared in the January issue of the "Journal."



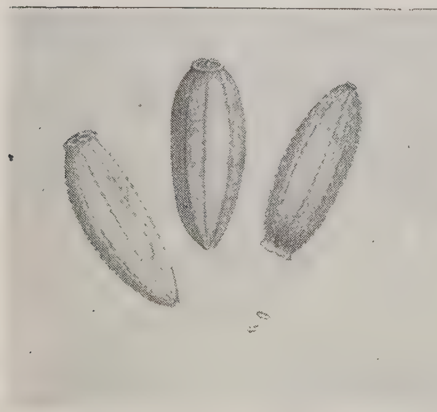
STELLARIA MEDIA: CHICKWEED. Colour brown. Occurs most frequently in white clover. In Canada classed as a secondary noxious weed seed in seed of turf and forage grasses. Australia admits not more than 200 seeds to the ounce. An annual weed of cultivated land and open pastures.



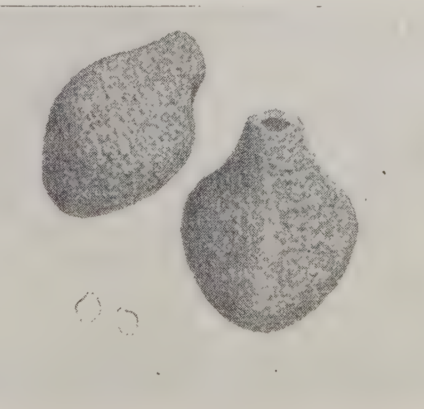
CUSCUTA EPITHYMUM: DODDER. Colour grey or brown. When the seed is bisected the characteristic coiled embryo can be seen. An impurity of rather rare occurrence in white clover, red clover, and *Lotus major*. A prohibited weed seed in Australia and Canada. Classed as a noxious weed seed in the United States and regarded as most objectionable in England. A parasitic weed usually found on clovers or other leguminous plants.



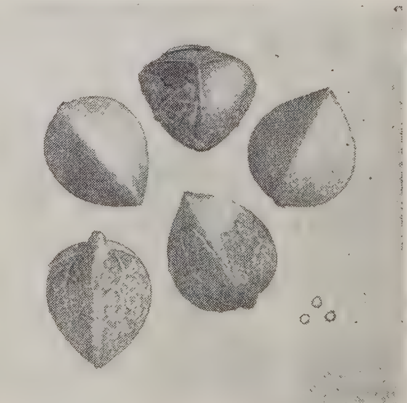
BROMUS MOLLIS: GOOSEGRASS. Seed straw-coloured. Occurs very frequently in ryegrass, from which seed it is difficult to dress out when the awn and papery margins of the lemma or outer husk have been beaten off during threshing. An annual grass often abundant in open pastures.



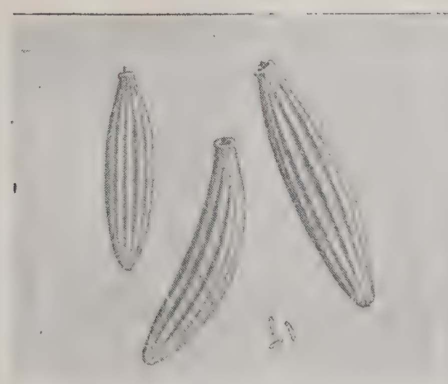
SENECIO JACOBEA: RAGWORT. Colour yellow or brown. Occurs with medium frequency in *Lotus major*, browntop, and more rarely in crested dogstail. Australia admits not more than 100 seeds to the ounce. A pasture weed most aggressive in districts of high rainfall.



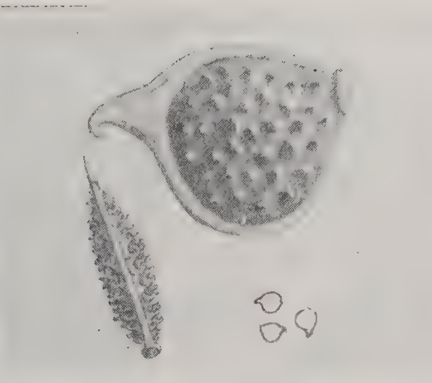
CONVOLVULUS ARVENSIS: BINDWEED. Colour grey. Occurs rarely in cereals. Australia prohibits importation. In the United States and Canada classed as a noxious weed seed. An aggressive perennial weed with twining stems and also underground twitch-like stems.



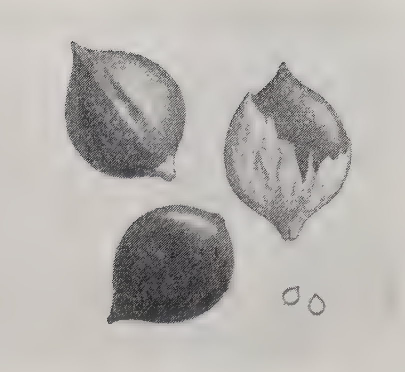
RUMEX ACETOSELLA: SHEEP'S SORREL. Colour brown. Occurs with great frequency in white clover. Australia admits not more than 200 seeds to the ounce. A perennial weed often abundant on cultivated soil and in pastures on light land.



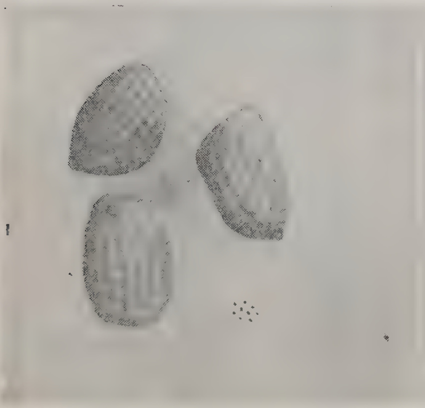
CREPIS CAPILLARIS (Crepis virens): HAWKWEED OR HAWKESBEARD. Colour light brown. Occurs frequently in browntop and crested dogstail. Australia admits not more than 10 seeds per ounce. An annual or biennial weed common in pastures.



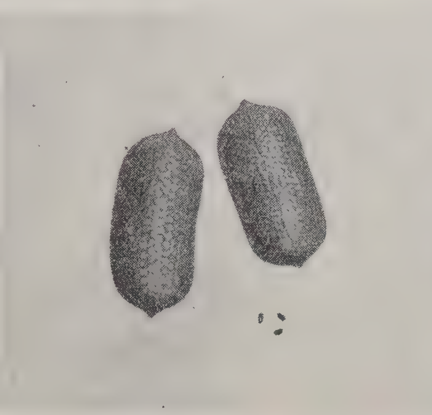
RANUNCULUS PARVIFLORUS: SMALL FLOWERED BUTTERCUP. Colour brown. The hooked hairs are usually removed when the seed is threshed. Occurs frequently in ryegrass. Australia admits not more than 20 seeds to the ounce. An annual weed sometimes abundant in pastures on heavy land.



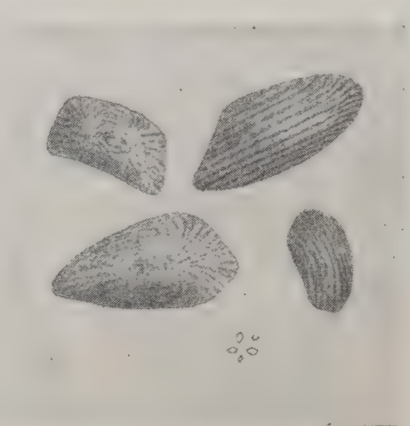
POLYGONUM PERSICARIA: RED SHANK, WILLOW WEED, LADY-THUMB. Colour black. Occurs frequently in flax, lucerne, and red clover. Australia admits not more than 30 seeds per ounce. An annual weed of cultivated land.



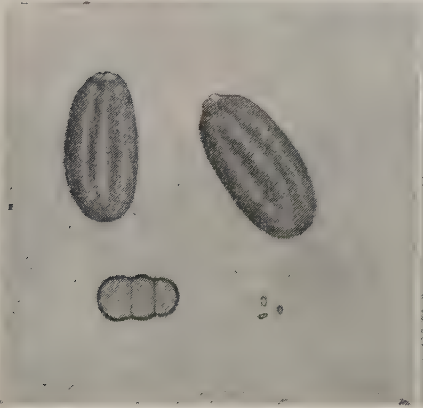
BARTSIA VISCOSA (Odontites viscosa): TARWEED. Colour yellow to brown. The extreme oiliness of the seed is an aid to identification. Occurs frequently in browntop. Australia prohibits importation. An annual weed of infertile pasture land.



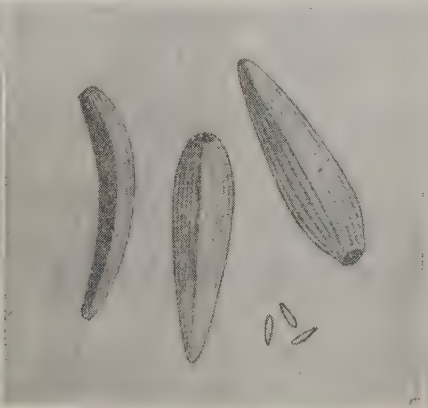
HYPERICUM PERFORATUM: SAINT JOHN'S WORT. Colour black. Occurs rarely in *Lotus major* and white clover. Australia prohibits importation. A perennial pasture weed with a twitch-like habit of growth.



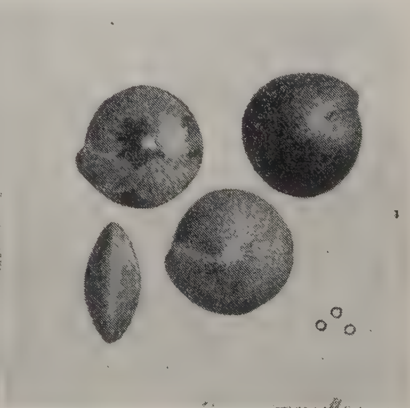
PLANTAGO MAJOR: BROAD LEAVED or GREATER PLANTAIN. Colour brown to black. Occurs most frequently in white clover. Australia admits not more than 100 seeds per ounce. A perennial weed of pastures and lawns.



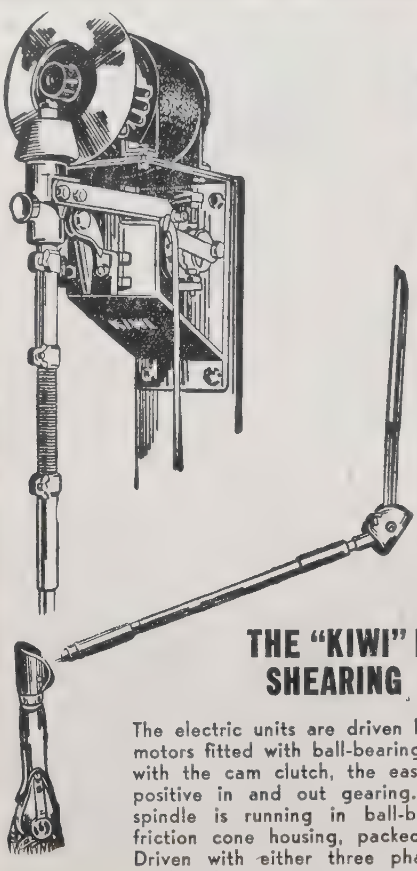
CAPSELLA BURSA-PASTORIS: SHEPHERD'S PURSE. Colour brown. Occurs with medium frequency in white clover, browntop, and yarrow. An annual weed of cultivated land and open pastures.



LAPSANA COMMUNIS: NIPPLEWORT. Straw coloured. Occurs infrequently in cocksfoot and ryegrass. Australia admits not more than 20 seeds to the ounce. An annual or biennial weed.



CHENOPODIUM ALBUM: FATHEN. Colour black. Occurs frequently in white clover. Australia admits not more than 200 seeds per ounce. An annual weed of cultivated land.



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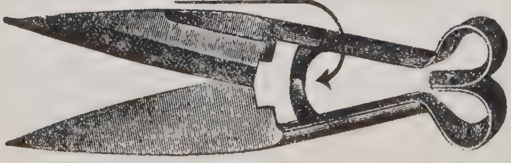

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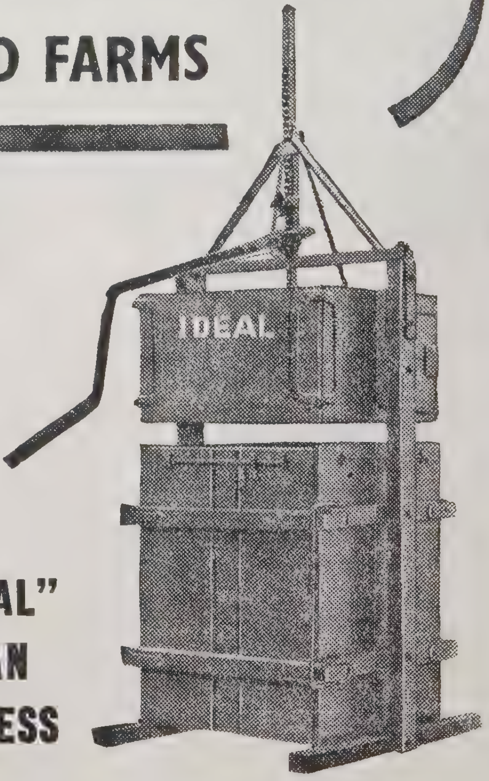

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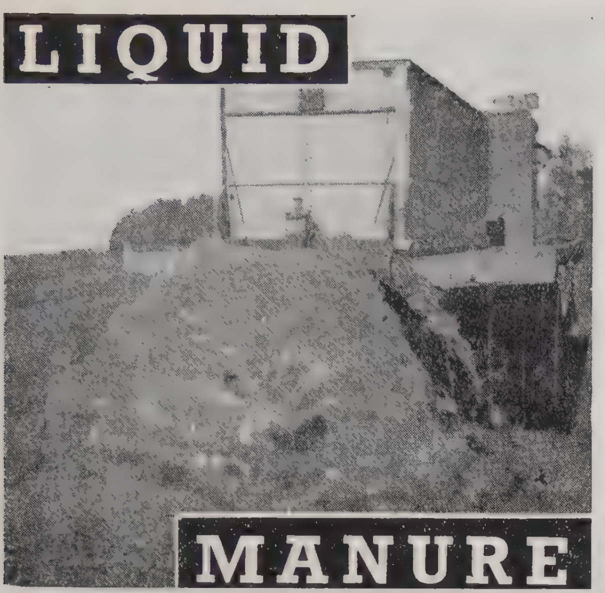


LIQUID MANURE

Stock Droppings Are Worth £18 of Fertiliser for Every 50 Cows Milked

THAT it is economically feasible to prevent most of the loss from the droppings and urine voided at milking time has been conclusively demonstrated both experimentally and practically. In this article Mr. G. A. Blake, Instructor in Agriculture, Hastings, presents facts regarding the collection, distribution and value of "liquid manure," this term being synonymous with "shed washings."

ONLY a small portion of the potential pasture-producing and soil-conserving value of the excrement from dairy cows is utilised. It has been estimated that more than 12 tons of droppings and urine are voided by a dairy cow in a year, three-quarters of which is deposited in the grazing fields, where its full value remains unrealised because of improper distribution, even though the higher fertility of those fields used for night paddocks is generally recognised. Enormous losses occur through failure to save the valuable liquid portion through loss of nitrogen in fermentation and drying and the leaching-out of soluble nutrients by rain. Manure dropped on the pastures produces some return provided systematic chain harrowing is carried out, but a regrettably large part of the manure loss results from wasteful methods of handling that portion which is practically all recoverable, that is, the excrement voided in and around the milking shed.

Farmers generally do not understand the true nature of animal manure, and especially the perishable character of its valuable constituents, or the inefficient methods of handling manure would not be so obvious.

The greater ease of maintaining soil fertility under livestock farming than under cash cropping demonstrates the value of animal manure, and it is the proper collection and utilisation of the manure voided at milking time that returns such a dividend in improved pastures and consequently higher butterfat production. Too often are to be seen heaps of farmyard manure thrown over the rails of the stockyard, and in many cases left there for years. This heap is usually only part of what is actually deposited in the shed and yards, and represents the summer and autumn collection only. The thinner droppings of the spring are usually liquefied by the addition of water and washed away into a creek or drain.

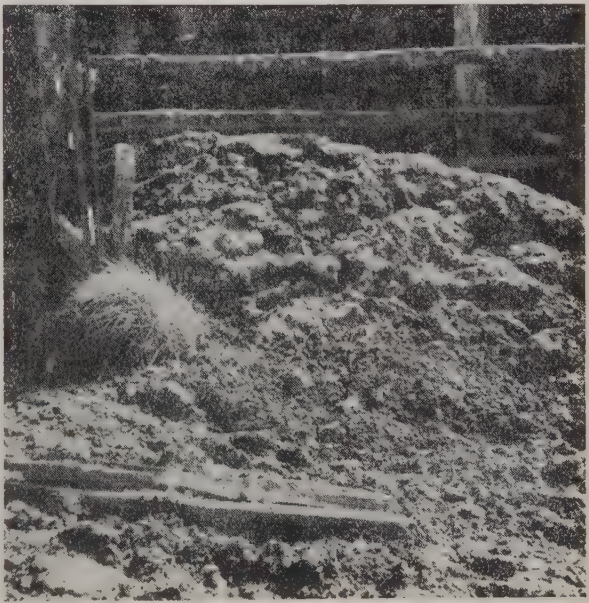
While it is admitted that most farmers do periodically remove the heap of animal manure and spread it on the pastures, the area treated is almost negligible, while the material distributed has greatly decreased in value due to the leaching effect of the elements, and the urine—the more valuable product—has been completely lost. The urine is rich in potash and nitrogen, which, being soluble, are readily available to plants, and hence the rapidity with which the plant foods become available is lessened.

Installations

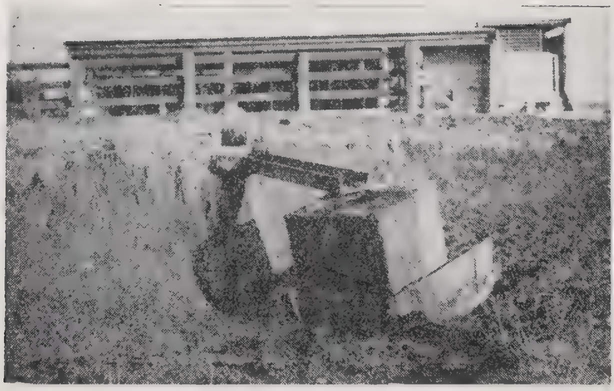
The simplest and least expensive installation, where the contour of the country allows, consists of a distributor into which all the shed washings gravitate, distribution taking place either daily or when the distributor is full. In this type, the distributor is usually a 200- or 400-gallon square iron tank fixed to a sledge or konaki. This method has much to recommend it, as all losses are minimised and the maximum potential fertility effect obtained by spreading the fresh excrement, but the results are slower than when stored manure is distributed.

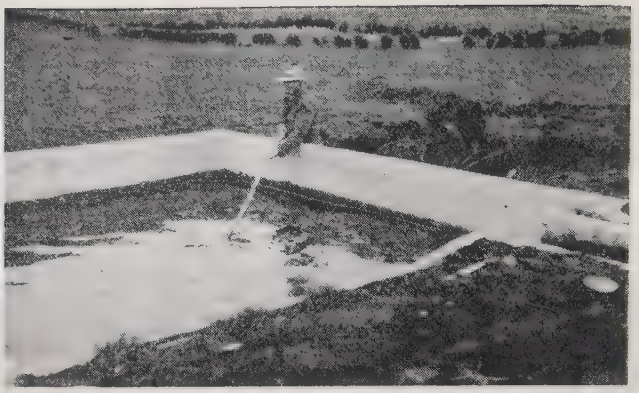
Although this method is greatly superior to the methods of handling practised on most farms, it has been found that the constant emptying of the distributor becomes irksome, while in periods of extra work, such as during harvesting, the daily routine is neglected. Again, it has to be emptied in all weathers, and unless fitted with wide wheels or runners, will cause cutting-up of gateways and pastures.

The second type of installation consists of a sump in which the shed washings for several days or even weeks can be collected, distribution taking place at any

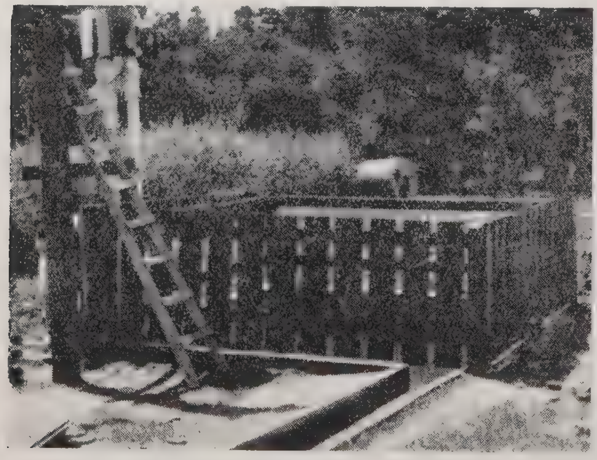


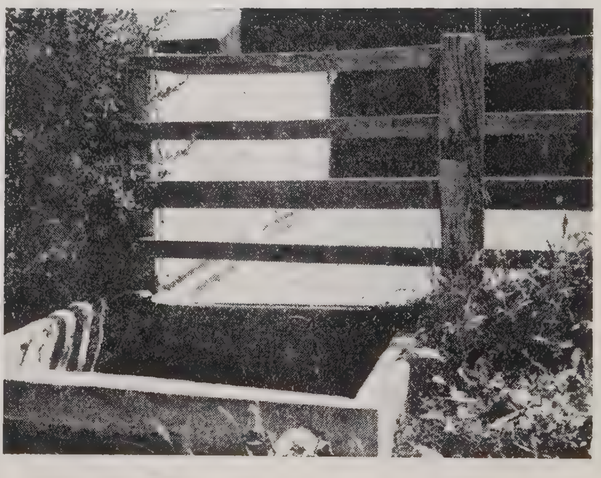
Heaps of farmyard manure thrown over the rails of the stockyard.



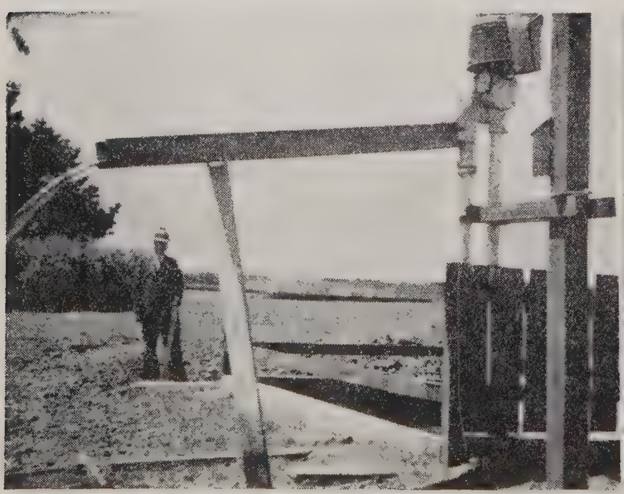


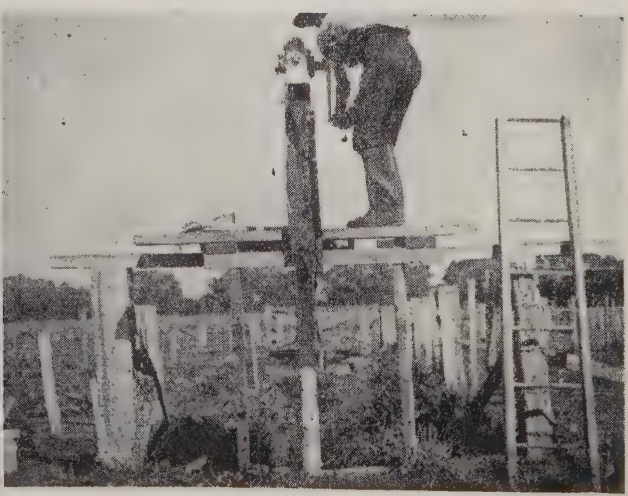
Left.—A simple installation where the washings gravitate into the distributor. Right.—A sump to hold the washings for a month.





Left.—A sump protected against stock and children. Right.—A sump in this position contravenes the Dairy Regulations.





Left.—An electrically driven manure pump. Right.—A hand pump is not advised because of the labour involved.

convenient time after a reasonable quantity has been collected. No hard and fast rule can be laid down as to the proper size to make these sumps for different sized herds, but most users prefer one large enough to hold a month's collection. Experience has shown that quicker and better results are obtained when the manure is held in the sump for 14 days before spreading, and from this the value of allowing bacterial action to take place before distribution is evident.

One user of liquid manure with several years' experience is so convinced of the value of holding the manure for a considerable period before distribution that he has recently installed another sump so that he can hold the material longer before application to the pastures, and intends later to install several sumps so that the distribution can be carried out in fine weather only and when other work is not urgently requiring his attention. Farmers are advised to make the sump as large as practicable.

About 2 gallons of water per cow per day are used in washing down, but to this must be added the dropping and urine. A quick method of estimating the approximate capacity of a sump to hold a month's collection is to multiply the number of cows milked by 100, the answer being in gallons.

Dimensions of Sumps

The following table shows the dimensions of popular sized sumps:—

Depth.	Width.	Length.	Capacity. (Gallons).
6ft.	10ft.	10ft.	3,750
6ft.	6ft.	20ft.	4,500
6ft.	12ft.	14ft.	6,300
5ft.	8ft.	8ft.	2,000
6ft. deep	circular,	10ft. dia.	2,944

The most common type is the square or oblong sump, preferably not over 6ft. deep to allow of easy stirring during emptying. By using three bags of cement to a cubic yard of shingle and making the walls and bottom 3in. to 4in. thick, approximately 6yds. of shingle and one ton of cement will provide the material for a sump of 4,000 to 5,000 gallons capacity, which is a popular size. Reinforcing of the walls is necessary, especially at the corners. A slight fall in the bottom of the sump towards the outlet makes for easy cleaning, if necessary.

The sump should be covered with a close-fitting lid to prevent in part the loss of ammonia nitrogen by evaporation and as a protection for children and stock.

Where the sump is totally enclosed in the ground and is dug in soil of a clayey nature, the walls may be plastered, but the bottom should be 3in. thick. With this plaster type of wall a round sump is preferable, thus avoiding all corners. Wire-netting of a heavy gauge is pegged to the clay walls with staples made from No. 8 fencing wire, the whole being covered with a concrete mixture thickly enough to cover the netting completely, about 1½in. to 2in. A thin coat of plaster consisting of equal parts of sand and cement is applied later. However, as more skilful labour is required for this type of construction, the cost is practically the same as for the more solid structure. Sumps made by plastering direct on to the clay without netting have not proved satisfactory and have filled with water from the surrounding soil. Unplastered earth sumps have also proved unsatisfactory.

In Switzerland, where the collection of the animal manure is a feature on every farm, the latest development is to collect the shed washings in a septic tank from which the overflow, almost clear liquid, is caught in a sump and later distributed over the pastures, but highly profitable and outstanding results have been achieved in New Zealand without this added expense of constructing a special septic tank. One installation of this type has been erected in Taranaki, but visual results do not appear better than those obtained from the use of the sump only. In this instance, the sump holds 25,000 gallons, and the cost was £150.

Position of Sump

It should be noted that the Dairy Regulations require the sump to be 30ft. from the shed or yards, so that a sump constructed at the edge of the yard, even though 30ft. from the shed, contravenes the regulations.

Emptying the Sump

Wherever possible, the distributor should be filled from the sump by gravity feed through a 3in. tap, which will deliver 100 gallons of liquid manure per minute, or approximately a ton in two minutes. It is not advisable to lead the manure through any great length of piping from the sump to the distributor unless the fall is very steep, as there is always the danger of a blockage, even with a 3in. pipe. To obtain gravity feed into the distributor it may be necessary to construct a special roadway, but if this is done with a bull-dozer, the expense is only a fraction of the cost of a pump, while running expenses are practically nil.

On flat land, however, the only type of installation possible is one which includes a sump and a pump to raise the manure into the distributor. These pumps are the result of years of experimenting and are specially suitable for the work. They are of different types, either hand or electrically driven, and will lift a ton of manure in a few minutes. If electric power is available, the use of a hand pump is not advised owing to

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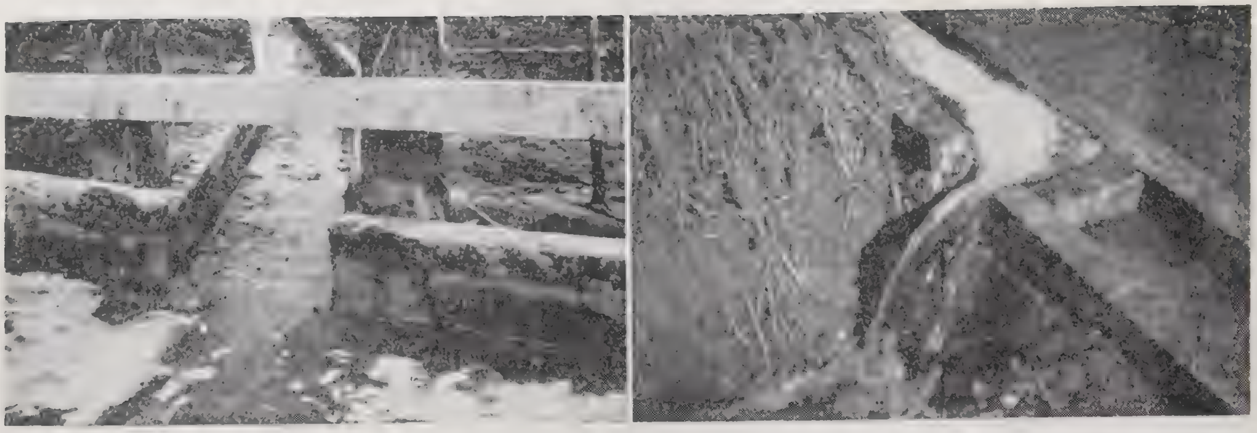
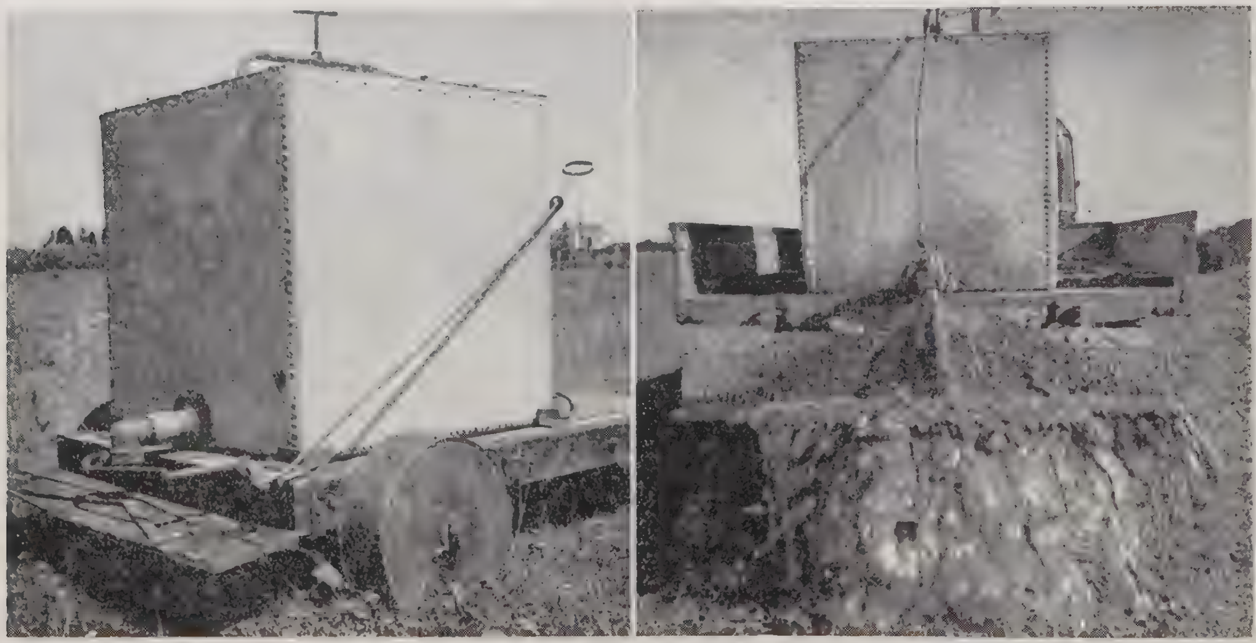
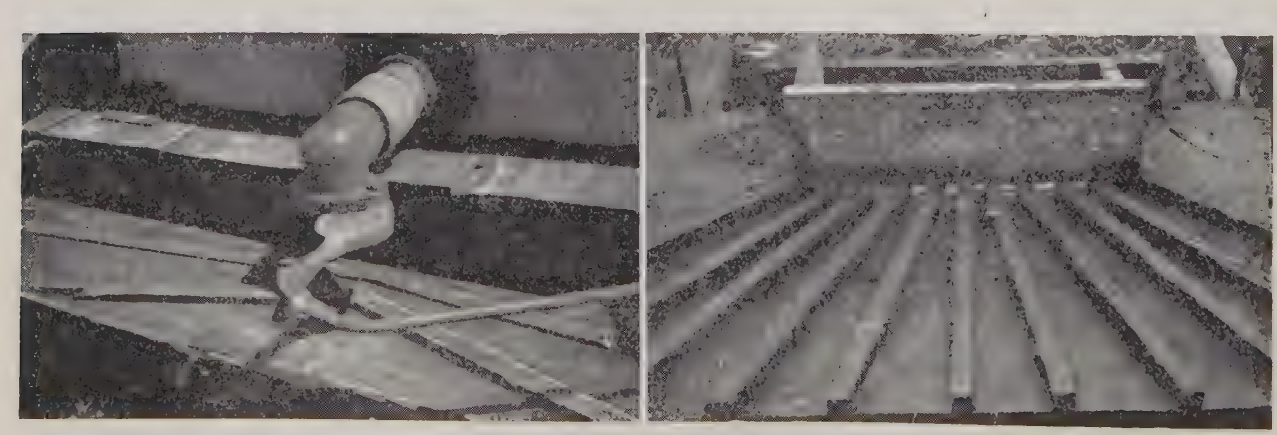


Left.—A 9in. wall to hold the solids and water on the yard. Right.—A by-pass which allows unwanted water to escape through the side of the drain.



Left.—The most common type of distributor is the square iron tank fitted to a konaki. Right.—A distributor mounted on a motor-lorry.



Left.—A spreader board for use with a sledge or konaki. Right.—A spreader for use on a lorry or wagon where the tap has a vertical delivery.

the labour involved. Some farmers are using a specially constructed distributor in which a vacuum is created by a milking machine pump, the manure thus being forced up into the distributor, but this type of outfit is expensive, and equally efficient models are available at a considerably lower cost.

Immediately before emptying by whichever method is employed, the material in the sump should be well stirred to break up the thick layer of sediment which usually settles at the bottom.

Daily Routine

Most yard and shed floors have been constructed so that the washings gravitate to one point before being disposed of through a drain. When a sump is installed, fit a board or similar block to the entrance of the drain so that the whole of the washings can be retained on the yard. This will probably mean the erection of a concrete wall about 9in. high at this point, but allows the solids, especially during the summer and autumn months, to be broken up and made more fluid so that they can be easily swept into the sump, and will also more readily flow through the 3in. tap or be lifted by the pump. When the whole of the washings are liquefied, the board or block is lifted and the lot quickly swept along the drain into the sump.

A considerable portion of the droppings is voided close to the shed both before and after the milking period. If desired, these can be collected in a barrow and deposited direct into the sump, where they eventually become broken up and liquefied.

Some sheds are provided with drains at the junction of the shed and yard floors. In such cases, more water than usual is needed, for as soon as a portion of the floor is cleaned the water goes down this drain and more is needed for the balance of the yard. When a new shed is being erected, dispense with this drain, but in place of it build a small concrete wall around the yard. Because of the volume of liquid manure to be swept into the sump, the drain should be wide enough to accommodate the shed broom easily and have walls about 9in. high. Experience has shown that the shallow, narrow drain allows the liquid to slop over the sides. A similar fault also occurs with the wider curved-bottom type of drain.

By-passes

Where the layout is so constructed that all the washings eventually find their way into the sump or distributor, it soon becomes evident that some provision must be made to divert rain or other unwanted water, such as that used for washing the milking plant and cans. When it is realised that with a rainfall of 80 inches a stockyard 33ft. square will catch 200 tons of water a year, the need of some means of diverting it is again evident.

Because no two installations are identical in construction, different types of by-passes have been evolved. The best type so far encountered is constructed by making a slight depression across the base of the drain and placing in this depression a 4in. glazed pipe bend with the flange end flush with the bottom of it and the other end leading into a storm-water drain. Between milkings this pipe is left open, but when the drain is needed to carry the manure to the sump a plug is placed in the flange end of the pipe and the manure swept over it.

Another type is constructed by putting the sump alongside the drain instead of at the end of it. A portion of the wall of the drain is movable, and when the sump is needed this portion is removed and placed across the drain to divert the manure into the sump. When storm-water has to be diverted, it simply flows along the drain, past the sump and into a creek, or soaks away. In some installations two drains have been constructed from the yard, one for the manure to the sump and the other for storm-water leading away from the yard. Movable trapdoors are used at the entrances of these drains so that either drain can be closed or left open as desired.

Where the sump is considerably below the level of the stockyard the manure can be conveyed to it by means of 6in. pipes. In these instances another pipe drain of 4in. pipes may be used to divert the unwanted water, and by the use of suitable plugs either drain can be used as desired.

Distributors

The most common type of distributor is the square iron tank, either 200 or 400 gallon capacity, mounted on a konaki. The platform is constructed about 3ft. longer than the tank so that there is ample room in front to allow comfortable standing room for the driver. This is especially necessary when driving through gateways or over bridges. The konaki is fitted with the usual iron skid in front, while the wheels can vary in size from 18in. to 24in. in diameter, but must be fitted with a 6in. tread to lessen damage to gateways and pastures. A 2in. axle is sufficient to support the load. The tank, which is fixed on the back of the konaki, is fitted with a splash-proof lid and a 2½in. or 3in. tap that can be opened or closed quickly by remote control. If procurable, a cheese-vat tap is ideal, but failing this, any straight-through tap is suitable.

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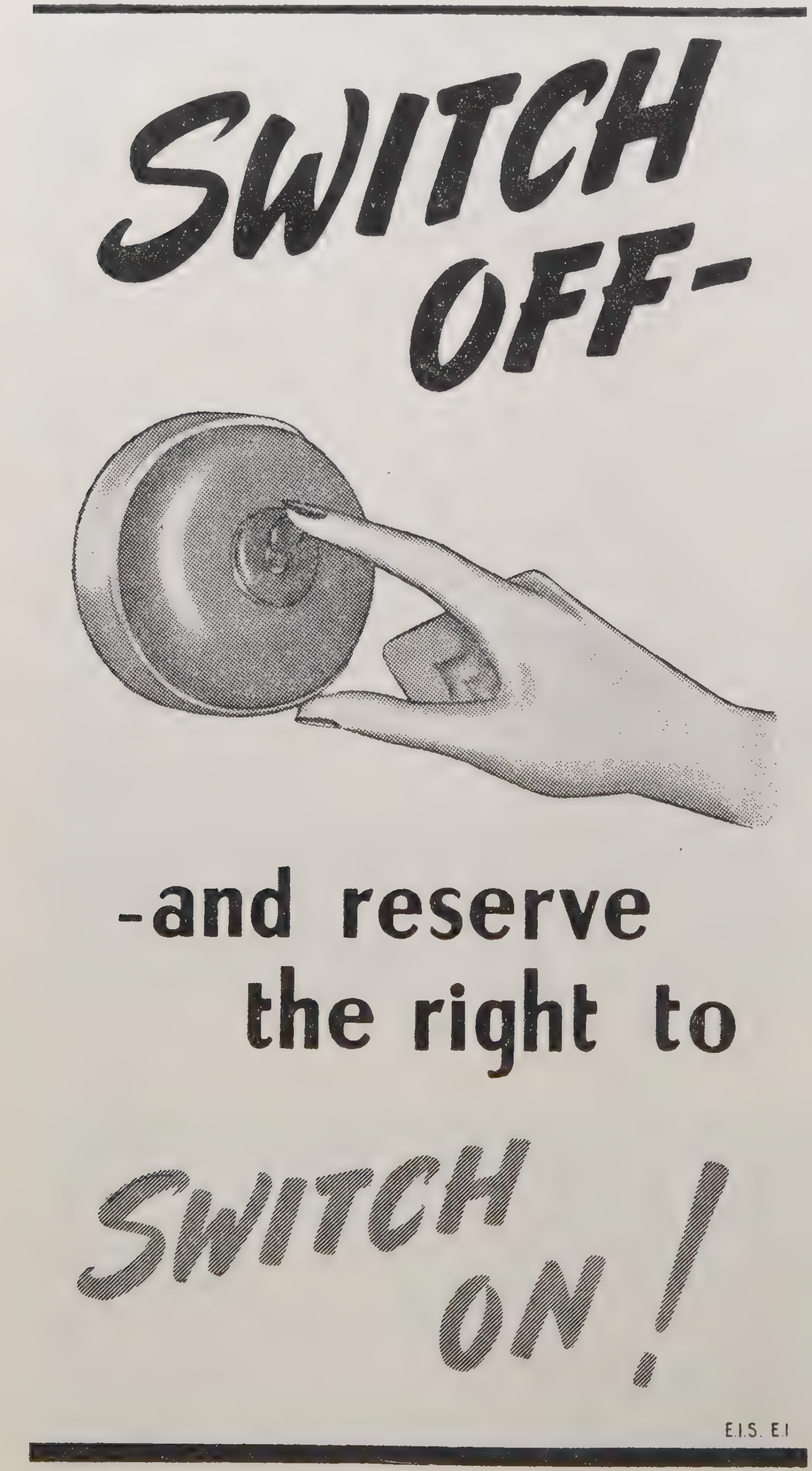


Square iron tanks are in short supply, and if they are unprocurable a distributor can be built with timber. This procedure is necessary in some cases where the fall is too small to allow the use of a tank. These wooden distributors are made from 1½in. timber, and a popular size is 6ft. long by 3ft. wide by 2ft. deep, having a capacity of approximately one ton of manure. In addition to the tap and splash-proof lid, it is advisable to fit two tie-bolts of ½in. iron across each end of the box so that if shrinkage occurs the bolts can be tightened and the joints again made waterproof. For this purpose, the sides of the box should project about 3in. beyond the ends and all other parts of the box, including the top and the bottom, should be built between the sides.

If the country is undulating and much surging of the liquid is likely in the box, baffle plates should be fitted to the inside to reduce wear and tear on the distributor. These plates are made from 1½in. timber, and are placed 2ft. from each end of the box and right across it but 1in. below the top to leave an air vent and about 8in. from the floor to allow sufficient room for the periodical removal of the sand that settles in the distributor.

A distributor may be mounted on a sledge, a konaki, a wagon, or a motor-lorry, so that in most cases the type of conveyance already in use on the farm is suitable. The sledge and the horse-drawn wagon both have a common fault in that the tyres or runners are too narrow for use in wet weather, both tending to cause damage to gateways and pastures.

Amount to Apply

The amount of liquid manure applied per acre varies within small limits, and experience has shown that from 3,000 to 4,000 gallons are required to treat one acre adequately. The best results from one application have been obtained from a distributor fitted with a 3in. tap drawn at a working pace for horses—that is, about 3 miles per hour and having a spread of 6ft. If this quantity is applied, it will be found that 200 gallons, or 1 ton approximately, will cover a strip 7 chains long by 6ft. wide. Heavier applications do not give a noticeably better result, while lighter dressings little more than maintain the sward in its present condition.

Different soil types, however, may respond to lighter dressings, but this can be ascertained only by individual trials. Many users maintain that after four annual dressings the sward has been so improved that further applications are unnecessary for some time, and all agree that it is a better policy to cover all the topdressable area of the farm gradually with one dressing than to concentrate on the same area year after year.

In very few cases is the capacity of the sump sufficient to treat a whole paddock, so that some time elapses from commencing until the field is completed. During this period it is not necessary to remove stock unless desired, as they neglect the newly treated area for about a fortnight, after which it is relished more than any other part of the farm.

Again, unless the sump is of exceptional capacity, distribution usually takes place monthly, so that no special period can be recommended for using liquid manure, but users affirm that the autumn supply should be used for promoting a growth of grass and clover to be utilised in the spring when the herd has again come into profit, and consider that this practice alone more than pays for the cost of the installation. In other words, it takes the place of ammoniated super but without any of its ill-effects. In an actual trial it was found that one application of liquid manure at the rate of 4,000 gallons per acre grew as much grass as 2cwt. of sulphate of ammonia per acre, in addition to which the sward was left in a better condition and again responded quickly, a feature not found with the artificial stimulant.

A measured growth of 9in. of ryegrass and clover in two months.

Spreader Boards

The types of spreader boards in use are many and varied, some being more efficient than others. From this collection three types have been selected as being the most suitable under different conditions.

Where the distributor is close to the ground, as when mounted on a sledge or konaki, the spreader consists of a board 12½in. wide by 1in. thick fixed 3in. to 4in. below the outlet of the tap and extending to the width of the conveyance. This board is fitted with cleats or slats of 1in. by ½in. timber radiating from where the manure drops on to it. This size is suitable only if the tap projects the manure on to the board in a vertical stream. If a cheese-vat tap is used the width of the board must be increased to 18in.

Three-quarters of the droppings are voided in the grazing fields.

Where the distributor is mounted on a wagon or motor-lorry and is fitted with a cheese-vat tap, the type of spreader recommended consists of a curved metal plate 3ft. long, semi-oval in shape, 20in. wide, in front of the tap. The straight edge or axil line of the oval is fastened to the distributor as close up under the tap as possible. The outer edge is suspended on two wires or chains so that the curve can be altered to give the desired spread. This spreader is easily manufactured on the farm from the side of a 40-gallon molasses or tar barrel.

The third type of spreader for use on a wagon or lorry where a tap with a vertical delivery is used is a modification of that used on a sledge or konaki. In this case the spreader board is 18in. to 24in. wide and 6ft. long. A box 18in. long, 6in. deep, and 6in. wide is built on the spreader board near the distributor but with the front side raised 1in. from it. The manure falls into this box and thus finds its way out through the opening between the front of the box and the spreader board, and is then controlled by 1in. by 1in. slats radiating from this opening to the edges of the spreader board.

Results

The results from the use of liquid manure at the recommended rate per acre—3,000 to 4,000 gallons—are outstanding, and in no case investigated could the same results have been obtained from artificial manure. Even under very adverse weather conditions, a distinct change in colour to an emerald green has been noted 13 days after application. This is followed by a big increase in the clover-content of the sward, with a natural filling-up of bare spaces. With the presence of this extra clover, the grass plants are invigorated and a dense sward results. The farmer's aim to make two blades of grass grow where only one grew before is actually realised. When used on a deteriorated sward containing many flat weeds, the weeds are invigorated, but the growth of grass and clover tends to make them grow in a more upright position, thus reducing the area occupied by them. In many cases, paddocks which would normally require ploughing have been brought back into good productive areas by the use of liquid manure, while hay paddocks which have been cut for several years and are usually deficient in clover have been so improved that heavier crops than ever before have been harvested after its use.

A measured growth of 9in. of ryegrass and white clover has been obtained in two months from one application of liquid manure during the late autumn, while in the same field the growth on the cocksfoot plants was 18in. high. Untreated adjoining fields, although closed to stock, showed practically no growth during the same period.

Liquid manure also has a considerable value for cropping, but the best results are obtained when the manure is applied before ploughing. Thus, for those farmers who are growing sugar beet, mangolds, or carrots, good crops can be obtained in spite of the rationing of phosphatic manures.

Fertiliser Value

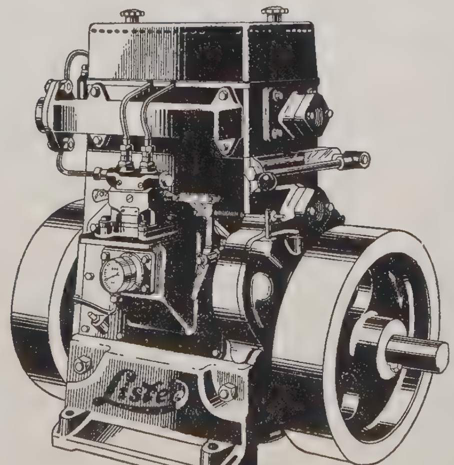
The fact that as yet a very small proportion of dairy farmers, even in these days of drastically-reduced supplies of artificial fertilisers, have equipped their farms with the means of collecting and distributing the shed washings makes it clear that some more definite information is required by them as to the real value of this material which is regularly washed away into streams and drains from the great majority of our dairy farms.

The experience of the pioneers in the use of the washings from the cowshed and holding yards on dairy farms in New Zealand has resulted in a relatively slow extension of the practice where the results obtained by topdressing of pastures and the fertilising of crops with this liquid manure have given outstanding results easily seen and understood by neighbouring farmers.

Every good gardener knows the value of liquid manure (animal droppings and water) and would give almost anything to have a regular supply. He envies the farmer who can let tons of excellent manure go to waste each year.

Records and Observations

To ascertain the actual manurial value of the shed washings in terms of nitrogen, potash, lime and phosphate and to gain some accurate details of the quantities that the average dairy farmer is wasting each year the writer arranged with two dairy farmers in Central Taranaki to keep the necessary records of the amount of liquid manure they obtained during the year from their respective herds. The shed washings were collected in each case in a sump to hold between 5,000 and 6,000 gallons. Samples of the liquid manure as it came from the sump for distribution on the pastures were taken each



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month and a complete analysis was made of each sample by the Department's chemist.

The measurement of the quantity of liquid manure, together with the analysis of the samples, has given some very interesting and instructive indication of what liquid manure so collected does actually contain in the way of fertiliser.

The observations and records were made on the farms of Messrs. R. Haseltine and L. Craig, Pukengahu, who are both firm believers in the value of this manure on pastures. To these farmers the thanks of the writer for their assistance and co-operation are recorded.

Mr. Haseltine's farm is typical of many of the smaller high-producing properties of Central Taranaki, having been heavily limed and well topdressed with phosphates over a number of years, while Mr. Craig's farming is on a larger scale and much less lime and phosphate have been used in the past.

These differences in liming and topdressing are very clearly shown in the results of the analysis of the liquid manure from each farm. Undoubtedly the quality of the pastures does affect the quality of the animal manure obtained from the stock depasturing on them.

Results of Analysis

In the following table the quantities of liquid manure collected on each farm are recorded for the months of August to May in the case of Mr. Haseltine's farm and for September to May for Mr. Craig's farm. The manurial content of the material collected each month is set out in terms of well-known fertilisers. Nitrogen is expressed as sulphate of ammonia and dried blood, phosphates as superphosphate, potash as 30 per cent. potash salts, lime as carbonate of lime, and magnesium as magnesium sulphate:

NO. 1 FARM.

Month.	No. of Cows.	Gallons of manure.	Sulphate of ammonia. lb.	Dried blood. lb.	Super. lb.	30% Potash. lb.	Lime. lb.	Mag. Sulph. lb.	Total. lb.
August ..	54	3,000	106	340	57	84	62	59	602
September ..	55	5,000	176	566	95	140	102	97	1,000
October ..	55	4,000	141	453	76	112	82	78	801
November ..	55	5,000	170	600	106	168	101	111	1,086
December ..	55	5,000	75	311	53	91	60	68	583
January ..	50	5,000	151	354	54	100	61	85	654
February ..	50	4,200	42	379	74	107	88	102	750
March ..	50	3,500	48	312	67	76	36	81	572
April ..	50	4,500	108	520	118	124	106	96	964
May ..	30	4,800	36	137	28	54	30	41	290
Totals ..		46,000	1,053	3,972	728	1,056	728	818	7,302
NO. 2 FARM.									
September ..	65	3,400	137	366	42	134	30	48	620
October ..	71	6,000	241	646	74	237	52	84	1,093
November ..	72	6,000	224	635	91	275	59	89	1,149
December ..	71	6,500	196	434	31	219	28	57	769
January ..	71	5,300	175	390	35	182	44	78	729
February ..	71	4,000	74	326	23	166	30	50	595
March ..	68	6,400	99	278	32	93	18	54	475
April ..	65	6,000	224	606	87	197	69	90	1,049
May ..	45	5,000	141	305	25	130	21	46	527
Totals ..		48,600	1,511	3,986	440	1,633	351	596	7,006

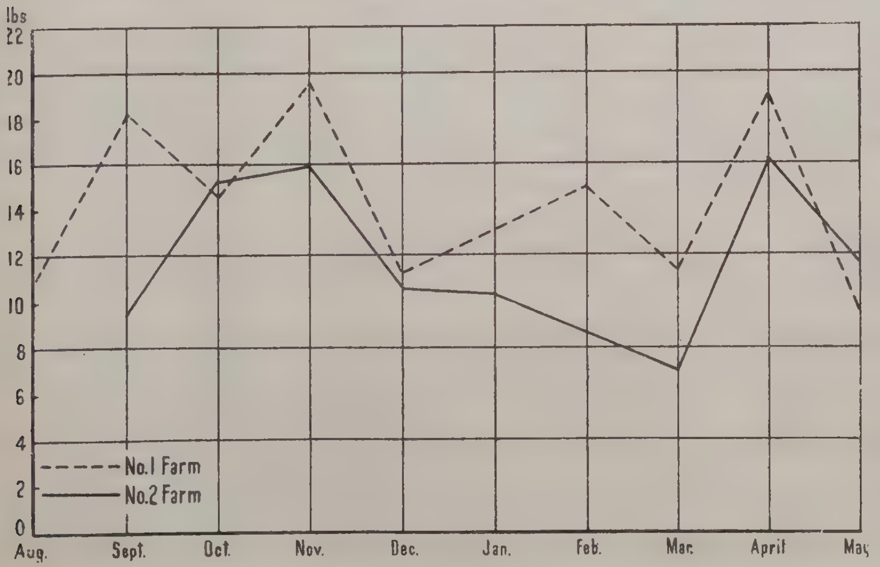
On No. 1 farm (Mr. Haseltine's) the total of 46,000 gallons of liquid manure was collected from a herd of 55 cows over the ten months for which records were kept. The sump, holding a little over 5,000 gallons, was large enough to hold the shed washings for one month, and with the distributor employed, the spreading of the manure from the sump took only a few hours once a month. At an average application of 4,000 gallons per acre, some 11 acres of the farm received a dressing containing, on the average, the equivalent of nearly 1cwt. of sulphate of ammonia, more than ½cwt. of superphosphate, a little less than 1cwt. of 30 per cent. potash, more than ½cwt. of lime and ¾cwt. of sulphate of magnesia.

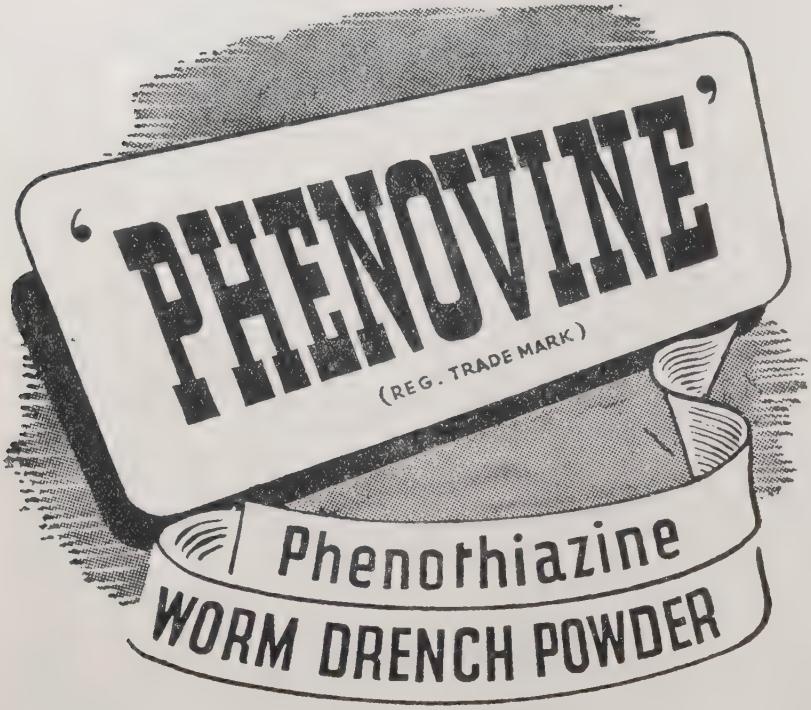
On No. 2 farm (Mr. Craig's) a total of 48,600 gallons was collected from a herd of 71 cows. Here, because of the greater average distance from the pasture to the milking shed, much more of the droppings were deposited on the way to the shed. On this farm about 12 acres were topdressed at the rate of 4,000 gallons per acre, resulting in an average distribution of over 1cwt. of sulphate of ammonia, about 36lb. of super, 1¼cwt. of 30 per cent. potash salts, 30lb. of lime, and 50lb. of sulphate of magnesia per acre.

In both cases, although the phosphate and lime content of this mixed fertiliser dressing is somewhat low when compared with such applications as 3cwt. to 4cwt. of superphosphate and 5cwt. to 6cwt. of lime per acre each year, the fact remains that a dressing of 4,000 gallons per acre of liquid manure collected as shed washings gives outstanding immediate results and on the two farms under observation the results of one application have been conspicuous after two years.

It is considered from observations on these and other farms that a decided improvement in the growth and density of the sward can be expected for three years from one application and that a satisfactory maintenance of the improvement can be obtained by triennial dressings. The limited quantities of phosphate and lime in liquid manure are apparently readily available, but the sustained improvement is probably due to physical and biological changes brought about by its use. There is also the probability that manure carries small quantities of growth-promoting substances which act in a manner similar to vitamins in animals.

TOTAL PRODUCTION PER COW PER MONTH OF FERTILISER & LIME.





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removes more worms in one dose than any other remedy

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FIRSTLY because Phenothiazine gives wider and more efficient control than any other drug yet discovered.

SECONDLY because, unlike any other drug, it sterilises the worm eggs at dosing and for a period of 4 to 5 days thereafter. Consider that one infected sheep can deposit up to *40 million* eggs on the pasture *daily* and you realise what this means . . . . *one dosing destroys up to 200 million eggs for every sheep dosed ! ! !*

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ALWAYS REMEMBER THAT YOUR GREATEST LOSS FROM WORMS IS NOT SO MUCH IN DEATHS AS IN THE SETBACK SUFFERED BY THE FLOCK IN GENERAL.

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Also COOPER'S WORM DRENCH
(Carbon Tetrachloride)
For Liver Fluke and blood sucking Worms.

COOPER'S N.C.A. DRENCH
(Nicotine, Copper-Sulphate, Cobalt)
For Black Scour producing Worms—common in lambs.

With triennial dressings, these two farms are thus able to improve and maintain the improvement on 30 to 40 acres.

Value in Money

Considering the monetary value of the liquid manure as an offset to the cost of the sump and the distributor and the time taken to spread the manure, the following calculations, based on present costs in terms of artificial fertilisers contained in the liquid manure from a herd of 50 cows, demonstrate that those farmers who are collecting the shed washings and distributing them on their pastures are not actually wasting time and money.

Based on the average for the 126 cows on the two farms under observation, each 50 cows produced per annum the equivalent of ½ ton of sulphate of ammonia costing £12 10s., ½ ton of 30 per cent. potash at £5, 4cwt. of superphosphate at 16/-, and 4cwt. of lime at 4/-, a total of £18 10s worth of fertiliser. The cost of the sump and distributor on the farms under review was about £30 in each case, and the labour in distribution about four hours per month. In two seasons the cost of the equipment and of labour for distribution was adequately met, leaving future costs for many years those of distribution only.

From £18 to £20 for every 50 cows milked may not appear very much to be wasting each year, but for the 1,800,000 dairy cows of this country the loss of the manurial value of the stock droppings in and around the cowsheds adds up to the tidy sum of £60,000 to £70,000 annually.

Since this investigation was carried out some farmers have constructed a holding yard behind the cowshed, and the extra voidings so collected have almost doubled the amount previously collected.

Trials with Liquid Manure

In order to determine the exact increase brought about by the use of liquid manure a trial was carried out on the Stratford Demonstration Farm. Two areas of a deteriorated sward were treated with one application of liquid manure and two similar areas in the same field remained untreated as a control. Wire netting frames, periodically shifted to new positions, were used to prevent stock from eating the growth, which was mown and weighed at intervals.

The following is a summary in seasonal periods of the yields of green weights from the trial for one year from the commencement on March 16, 1942:—

Date of Weighing.		Yields in lb. per acre. Liquid Manure.	Control.
Autumn	30/3/42	2,448	1,224
	7/4/42	1,152	792
	16/4/42	1,584	1,152
	27/4/42	720	504
	13/5/42	720	576
	2/6/42	576	648
Winter	3/9/42	1,440	1,296
Spring	18/9/42	936	864
	6/10/42	1,440	1,368
	23/10/42	3,528	2,880
	10/11/42	3,024	2,736
	2/12/42	2,304	2,376
Summer	18/12/42	2,088	2,376
	8/1/43	1,872	1,584
	29/1/43	2,160	1,728
	12/2/43	1,584	1,728
Autumn	19/3/43	5,112	4,320
Grand Total		32,688	28,152

A study of this table reveals three outstanding facts:—

1. **The immediate result.**—Within fourteen days of application exactly twice the amount of grass and clover was produced on the topdressed area as on the control.

2. **Sustained production.**—At practically every weighing through the year the treated area produced a greater weight of grass and clover than the untreated area, and even at the end of a year the differences in yields are still pronounced.

3. **Increased Yield.**—The increased weight of grass and clover produced in the first year alone from the one application of liquid manure was 4,536lb., or considerably more than 2 tons per acre. This represents an increase of 16 per cent. above that produced without liquid manure.

Two trials were laid down to determine the effect of one, two and three applications of liquid manure to an area within one year. The area selected for one trial was a fertile reclaimed swamp, where the addition of liquid manure was not expected to produce the best results. Contrary to expectations, a rapid growth, particularly of white clover, resulted from the first application. At the end of the trial no differences could be noted between the areas receiving two and three applications, but both were slightly better than the area receiving only one application. The second trial was laid down on a deteriorated pasture on the slopes of Mt. Egmont at an altitude of 1,400ft. above sea level. Here, the results of the other trial were repeated, but the impres-

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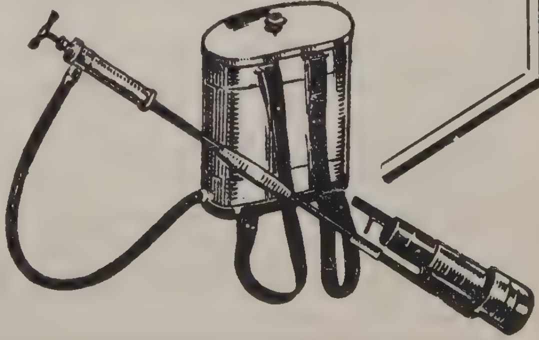

sion gained from these trials was that it was better to treat a larger area only once than to treat the same area twice, as the differences between one and two or three dressings were not outstanding.

Each of the plots treated with liquid manure was crossed with treatments of superphosphate, lime, and a combination of both. It will be seen from the analyses that liquid manure is low in both these ingredients, and this trial was instituted to determine what result would occur from their use with the shed washings.

Results were as follows:—

Superphosphate at 3cwt. per acre plus liquid manure produced slightly more grass than liquid manure alone.

Lime at 10cwt. per acre plus liquid manure produced slightly more grass than liquid manure alone, but not as much as when superphosphate was used.

Superphosphate at 3cwt. per acre plus lime at 1 ton per acre plus liquid manure produced more grass than any other treatment, but the increase over liquid manure alone is not considered sufficient to advocate the use of either lime and/or superphosphate on areas treated with liquid manure, especially while stocks of artificial manure are low.

Shed washings were also used in a trial on sugar beet, but as no yield weights were recorded the results of the different treatments could not be accurately estimated. From the various treatments, however, the area which received liquid manure before ploughing, followed by another dressing three weeks after germination, was conspicuously better than all other plots.

General

The question has often been asked, "Will the use of liquid manure spread such diseases as mastitis and tuberculosis?"

It often happens that strippings from infected quarters find their way into the sump, but on farms where the use of liquid manure has been a feature for many years these diseases have not caused more trouble than before its inception. Often the reverse is the case and the herd is freer from these troubles than before. Where the liquid manure is stored in a sump for some time before distribution, it is very probable that disease germs are destroyed there. A parallel instance can be found on sewage farms, where outbreaks of disease are practically non-existent.

The presence of viable weed and clover seeds in liquid manure is known, and for this reason its use on lucerne areas cannot be recommended.

Conclusion

Practical experience has shown that the manure from the milking shed and yards has a real and satisfactory value for pasture topdressing and for enriching areas of land intended for growing root crops, and is best applied in the liquid form.

The greatest benefit from its use is realised only when it is combined with good pasture management. It will not take the place of rotational grazing, chain-harrowing, drainage or correct utilisation of the herbage produced, but combined with these, maximum returns from liquid manure are assured.

Another very important and striking feature where the washings from the shed and yard are properly collected and regularly distributed is the remarkable improvement in the general condition of sanitation in and around the milking shed.

◆

Bushel Weights in Common Use

						No. bushels per sack.
Barley ..	**50lb.**	**reckoned**	**to**	**the**	**bushel**	**4**
Beans ..	**65lb.**	**"**	**"**	**"**	**"**	**3**
Bran or Pollard	**20lb.**	**"**	**"**	**"**	**"**	**7 to 10**
Maize ..	**56lb.**	**"**	**"**	**"**	**"**	**3½**
Oats ..	**40lb.**	**"**	**"**	**"**	**"**	**4**
Peas ..	**60lb.**	**"**	**"**	**"**	**"**	**3½**
Ryecorn	**54lb.**	**"**	**"**	**"**	**"**	**3½**
Wheat	**60lb.**	**"**	**"**	**"**	**"**	**3**
Ryegrass	**20lb.**	**"**	**"**	**"**	**"**	**6**

When any of the above grains are ground to a feed meal the bulk is thereby greatly increased and the reckoned bushel weight considerably decreased.

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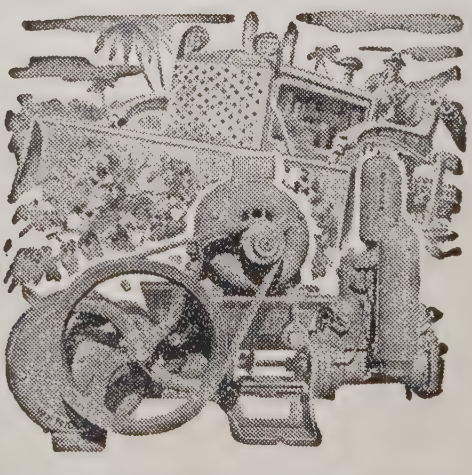
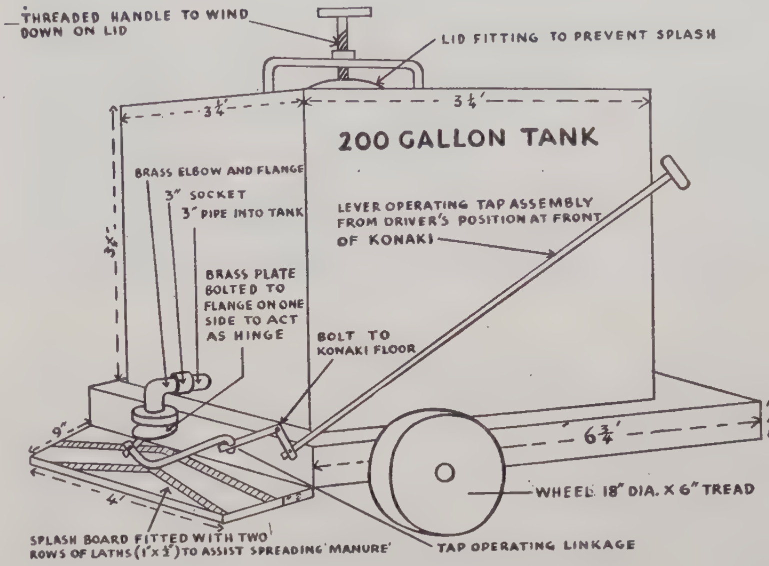


Construction of Liquid Manure Distributor


THREADED HANDLE TO WIND DOWN ON LID
LID FITTING TO PREVENT SPLASH
3¼′
3¼′
200 GALLON TANK
BRASS ELBOW AND FLANGE
3″ SOCKET
3″ PIPE INTO TANK
LEVER OPERATING TAP ASSEMBLY FROM DRIVER'S POSITION AT FRONT OF KONAKI
3¼′
BRASS PLATE BOLTED TO FLANGE ON ONE SIDE TO ACT AS HINGE
BOLT TO KONAKI FLOOR
4″
6¾′
9″
4′
WHEEL 18″ DIA. X 6″ TREAD
SPLASH BOARD FITTED WITH TWO ROWS OF LATHS (1″x½″) TO ASSIST SPREADING MANURE
TAP OPERATING LINKAGE

Constructional details of a liquid manure distributor.

TO assist farmers who may wish to construct a liquid manure distributor the following details are given.

The konaki is constructed with a platform approximately 3ft. longer than the tank to be used so that there is sufficient room in front to allow comfortable standing accommodation for the driver. The front end of the konaki should be furnished with the usual iron-shod skid, while the axle should be placed well to the rear to secure the necessary balance. Wheels should be from 18in. to 24in. in diameter with a 6in. tread and supported on an axle of 2in. diameter.

Where the distributor is to be drawn by horses the tank should not exceed a capacity of 200 gallons because of the weight involved, which is well over one ton when fully loaded. For preference, the tank, which can be made of either galvanised iron or wood, should be of the square type so as to reduce as far as possible the surge that takes place while the distributor is being driven along. Tank fittings should consist of a lid fitting close enough to prevent excessive splashing, and a tap of between 2½in. and 3in. diameter, the latter being preferred. If an old tap from a cheese vat can be procured, this is very suitable; otherwise, a brass fitting should be purchased, as iron taps soon rust and leak. The accompanying diagram illustrates a serviceable type of tap assembly together with the necessary control fittings. Construction details of the konaki are also shown.

It will be noted in the diagram that the brass flange piece and plate, which are lightly bolted together at one end of flange only, actually form the tap, and this is operated from the front of the konaki by movement of the lever through the linkage provided. The splash or spreader board, which should not be more than 4ft. or 5ft. long, is made from 9in. x 1in. timber, and is placed about 3in. below the tap and from 6in. to 9in. from the ground. Slats 1in. x ½in., as shown, are fixed to the board to assist in spreading the liquid manure evenly. The tank is held in position on the konaki by pieces of angle iron bolted to the floor at the corners of the container. To prevent splashing from the top of the tank, a simple arrangement is provided which is self-explanatory.

The manure distributor described is large enough for a shed milking 100 cows when emptying is contemplated daily. This provides for 2 gallons of washings per day per cow. The drain from the shed to the tank should be wide and flat so that tank should be wide and flat so that it may be swept down with a broom. It is also essential that provision be made to divert rain water from the tank when necessary. At all times avoid over-dilution of the manure by using just that amount of water necessary to maintain thorough shed cleanliness.

—*C. R. TAYLOR, Fields Instructor, Rotorua.*

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THE 1945 MODEL HAS NOW BEEN RELEASED.

Dual - Vacuum - Break. No hand stripping. Each Bail Unit a self-contained milker. No expert erector required. Any farmer can easily and quickly instal. No Service required. All wearing parts simple, and cheaply replaced. Incredibly simple. Any woman or child can operate. Perfectly silent. Restful and pleasant to use. Positively and thoroughly washes itself. Most hygienic milker ever made

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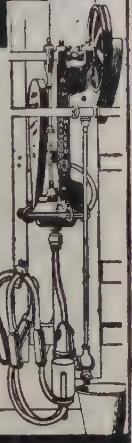

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Radio Broadcasts

RADIO talks to farmers will be given from Station 1YA, Auckland, at 7.15 p.m. on the following dates:—

June 4.—"Work on the Farm for the Coming Month," by Mr. E. B. Glanville, Acting Fields Superintendent, Fields Division, Department of Agriculture, Auckland, and Mr. P. S. Syme, Instructor in Agriculture, Department of Agriculture, Warkworth.

June 11.—"Young Farmers' Club Session," to be given by the Western Bay of Plenty District Committee.

June 18.—"Land Uses and Abuses," by Mr. J. E. Bell, Land Utilisation Officer, Department of Agriculture, Wellington.

June 25.—"Young Farmers' Club Session," to be given by the Kaukapakapa Young Farmers' Club.

KEEP PIGS GROWING

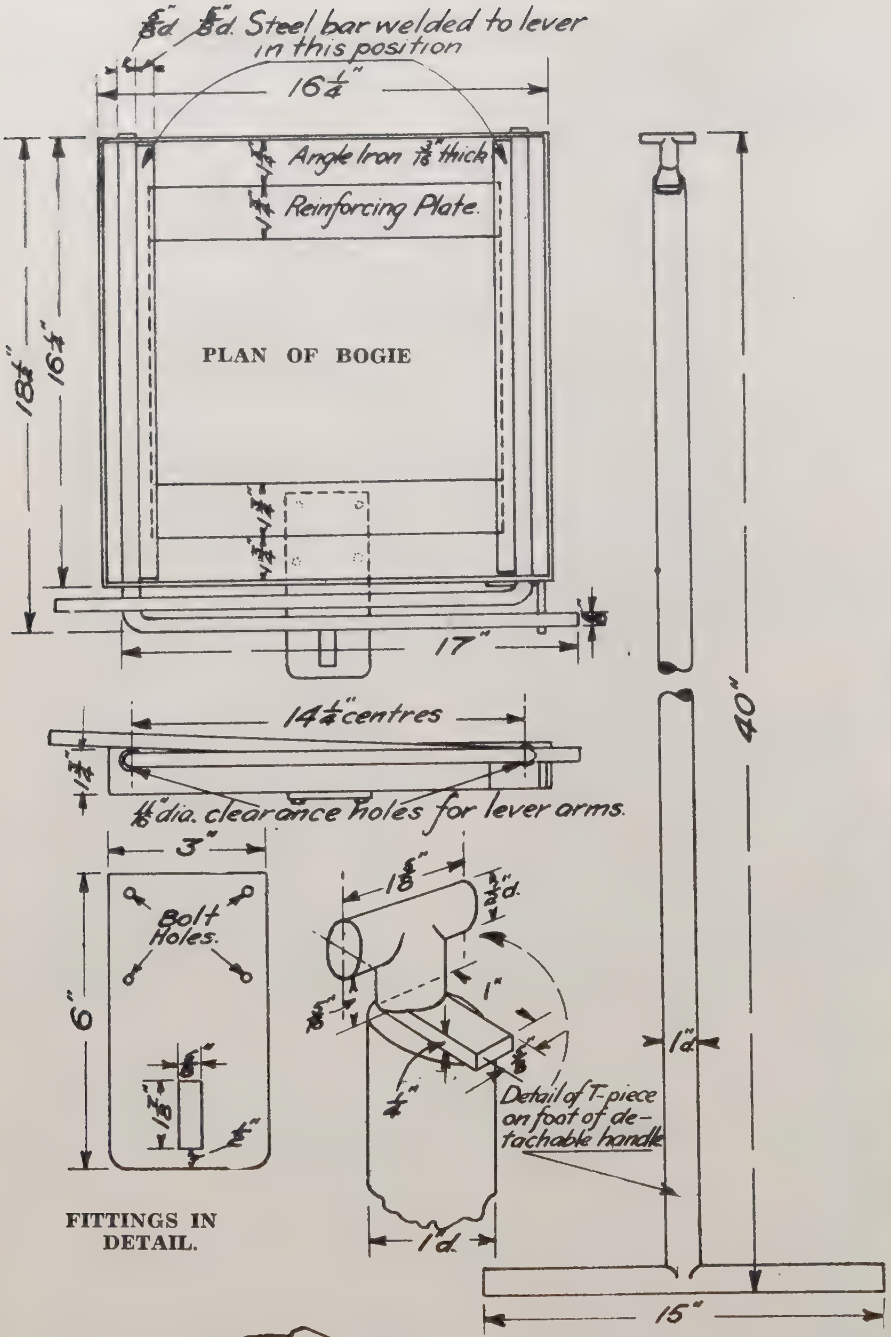
QUICK growth in pigs is generally associated with economic production; very slow growth indicates that something is amiss. This something is for the most part feed.

Pigs are predisposed to disease by malnutrition, particularly when they are kept under conditions which deprive them of their natural grazing environment. Disease can be minimised when sufficient feed is available to obtain quick growth, which in turn builds up vitality and resistance and at the same time allows the animal to make full use of the feed.

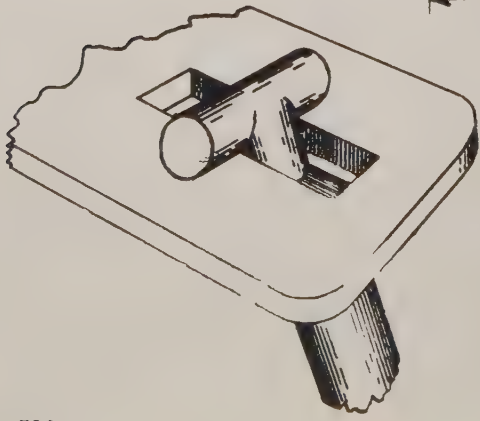
Honey House Bogie

— By —

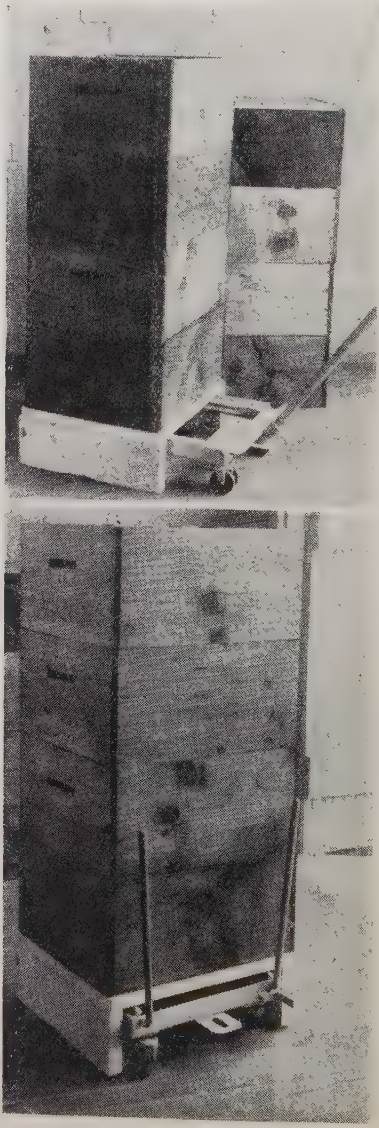
E. SMELLIE,
Apiary Instructor, Christchurch.


5/8"d 5/8"d. Steel bar welded to lever in this position
16 1/4"
Angle Iron 3/16" thick
1 1/4"
Reinforcing Plate.
1 1/4"
PLAN OF BOGIE
18 1/4"
16 1/4"
1 1/4"
1 1/4"
17"
14 1/4" centres
1 1/4"
11/16" dia. clearance holes for lever arms.
3"
Bolt Holes.
6"
5/8"
1 7/8"
1/2"
1 5/8"
3/4"d.
1"
5/8"
1/4"
5/8"
Detail of T-piece on foot of detachable handle
1"d.
1"d.
40"
15"

FITTINGS IN DETAIL.



Inverted view of handle attachment when in working position. T-piece is inserted through slot in plate and turned at right angles as shown.



Upper.—Bogie moving into carrying position. Lower.—Taking the load.

COMMERCIAL apiarists are well aware of the large amount of hand labour involved in the production of honey, and that time is always at a premium. Consequently, any appliance which will facilitate work in the honey house should be welcomed.

Haphazard methods are still common in some apiaries, and avoidable hand labour occupies a considerable amount of the apiarist's time.

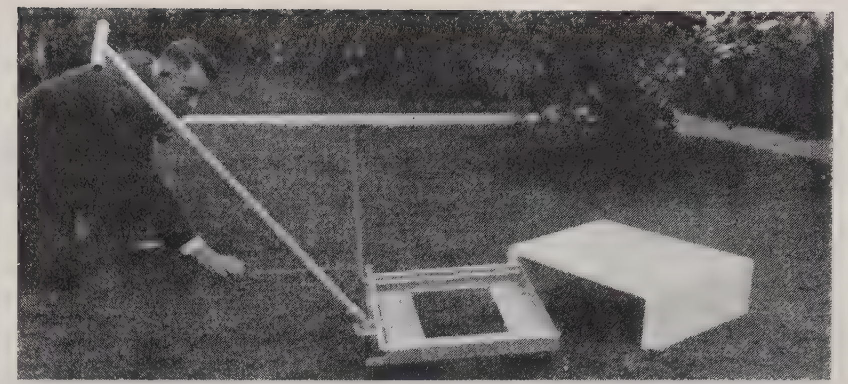
One method by which much of this class of hand labour can be eliminated efficiently is by the use of a honey house bogie as illustrated. From the start of the season's activities until the finish of honey extracting operations, large numbers of supers, both full and empty, require to be loaded and unloaded or moved about in some manner. For such purposes the appliance is ideal. It is very simple and rapid in application; a stack of full supers can be elevated and moved with ease, by even a juvenile operator. A handle can be used if necessary, but this can be dispensed with for most purposes.

While other types of bogies are used by some apiarists, the principal feature in favour of the type illustrated is that only one set of wheels is necessary to move any number of stacked supers, whereas to release the fixed wheel types additional hand labour is necessary. A beekeeper or local blacksmith can manufacture this appliance with no difficulty. Sufficient wooden platforms should be available to cover all requirements. These can be made very cheaply, their height being governed by the size of the castors used on the chassis.

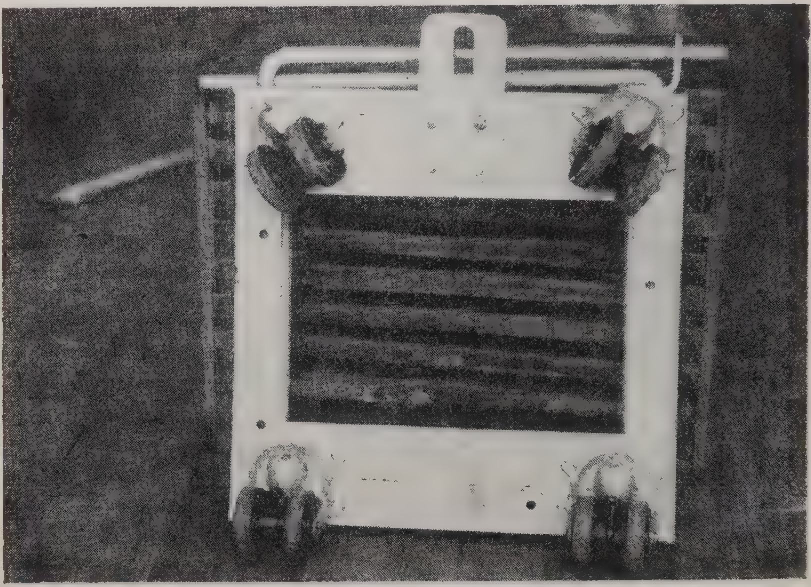
To reduce the weight to a minimum, the chassis is made from 1¾in. by 3/16in. angle iron, and for strength is reinforced at each end by welding sections 1¾in. wide to the inside bottom edges of the side angle pieces. These reinforcing sections also provide the space to bolt the castors into position.

The elevating apparatus is made from ⅝in. round iron rods, and the pieces are so welded that the load is absorbed by the bogie when the handles are raised vertically. Provision should be made for the handles to rest slightly past the vertical when in the raised position in order to prevent vibration, which may cause them to return to the free position when the load is in motion.

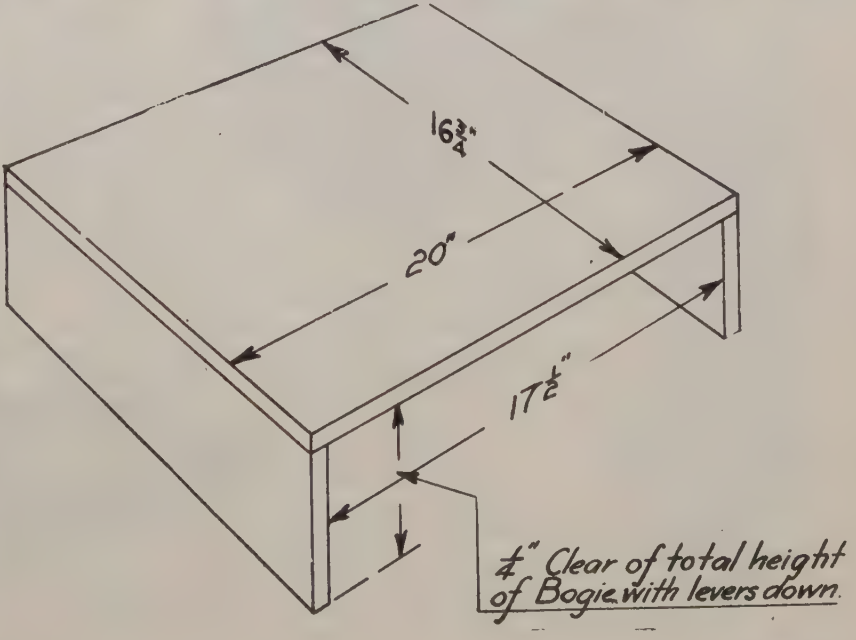
All the relevant details of the appliance can be readily seen in the photographs and the specifications are indicated in the drawings, with the exception of the inside height of the wooden bridge, which is ¼in. more than the overall height of the bogie with the castors fitted.



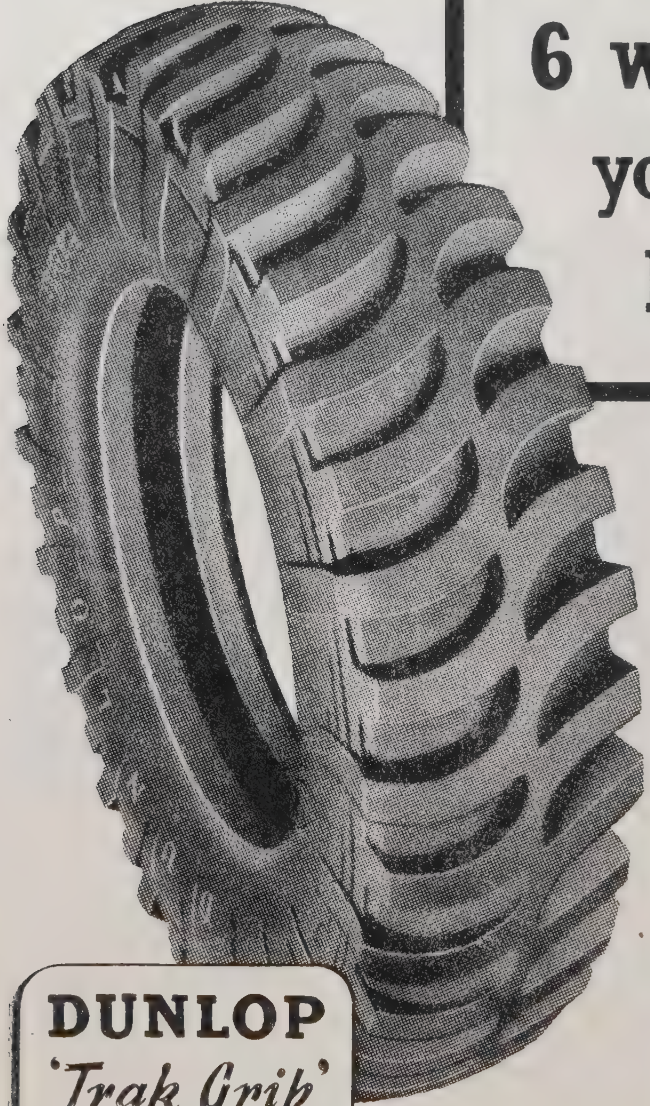
Bogie and platform.



Bottom view showing castors.



DUNLOP suggests 6 ways to make your Tractor Tyres last LONGER!



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'Trak Grip'

1. Correct inflation pressure is the most important factor in the life of tractor tyres. Check pressures regularly.
2. Wheel-slip is a serious cause of tread wear—check over a distance and, if necessary, add more weight to tyres and wheels by use of water or extra wheel-weights.
3. If you do not house your tractor when not in use, cover tyres with sacks to protect from sun and weather.
4. Inspect tyres regularly for base cuts and have repairs effected immediately—otherwise the cord casing may be ruined through moisture.
5. Ensure wheel and tyre flange nuts remain tight. Loose nuts will cause serious damage to your wheels.
6. When tyre treads are worn smooth—consult your tyre dealer regarding remoulding.

With the compliments fo

DUNLOP

Pig Production on Orchards

ORCHARDISTS are encouraged to explore the possibilities of supplementing their main livelihood by developing their by-product, waste apples, by feeding them to pigs. Orchardists can possibly produce 25,000 baconers worth £75,000 to £100,000. This number would be a real help towards those extra pigs New Zealand needs to fulfil her promise of providing pig-meats to the Pacific armed forces.

By

H. M. PEIRSON,

Superintendent of the Pig Industry, Wellington.

IT is recommended that at least one sow be kept by every orchardist, and on bigger holdings one sow for every 10 to 12 acres. The common sense and personal interest of the owner are the biggest factors in the success of pig production. If this interest is directed now towards provision of good accommodation and an adequate feed supply, the cardinal errors made by most beginners in pig-keeping will be avoided.

Accommodation for a sow and her progeny (14 baconers) should consist of a sow shelter or farrowing house, 8ft. x 8ft., on skids. This is usually placed in the cow or horse paddock. A corner of this paddock is fenced off (about one square chain), in which the sow and litter may be confined when necessary, but which is usually left open. This sow house may sometimes be used for stores or fattening pigs running in the orchard. Further accommodation for stores and fattening pigs should consist of a similar 8ft. x 8ft. permanent house, with an 8ft. x 8ft. concrete-floored yard, and a run-out, 1 chain square or greater, close to the bulk feed supply.

The cost of new material for the sow house should not exceed £10 (see Bulletin No. 177, page 27, and for the permanent house, £25, see page 15, or other pages, of the same bulletin).* On many farms some of the material required will be already available.

Feed Supply

The first bogy the orchardist has to overcome is the supposed difficulty of producing pigs, especially weaners, without skim-milk. The absence of milk is not a real difficulty. Forty-pound weaners have been produced on grain and roots or grain and apples without skim-milk. The next bogy is that in the absence of skim-milk a watery substitute such as diluted molasses is necessary to produce a flow of milk in the sow. Molasses has some value, but it can be done without. Provided sows get suitable feed and sufficient water to drink, they can produce all the milk required for good litters.

What is 1lb. of Feed?

In the discussion that follows 1lb. of feed means 1lb. of any grain or grain-meal mixture, barley, pollard, peas, oats, maize, meat-meal, or 1 gallon of milk. One pound of grain-equivalent feed can be obtained by using any of the following:—10lb. of swedes, mangolds, turnips, kumikumis, marrows, rape, kale, chou moellier, silver beet, grass, or other green crop, or 8lb. of carrots, or 5lb. of sugar beet, or 4lb. of potatoes, artichokes, or **apples.**

Pig's Daily Requirements

Amounts for a dry sow:

A dry sow wants 4 to 6lb. of feed daily. This can be made up of half to 1lb. of meat-meal daily, plus 16 to 20lb. of apples, or twice that amount of mangolds, carrots, or turnips. If the sow is in good condition, ½lb. of meat-meal will be enough. The more building up required the more meal or grain must be used. If no roots or apples are available, feed ½lb. meat-meal along with up to 1½lb. barley, maize, or peas, and let the sow out to grass. If there is no grass, give her soaked lucerne chaff, about 3 to 4lb. per day.

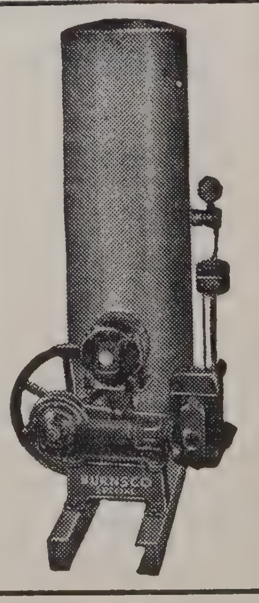
Amounts for a sow and litter:

A sow with a litter needs 4lb. of feed for herself and 1lb. for every pig of the litter. At least two-thirds of this must be good feed. A sow and a litter of eight should get 2lb. of meat-meal, 6lb. of barley or other grain, along with 16 to 20lb. of apples, or the equivalent in roots, grass, or lucerne chaff. Creep feed the little pigs from 3 weeks old. Until weaning give them part of the sow's ration at the rate of 1oz. of meat-meal and 2oz. of grain daily per piglet in a slop at 3 weeks, gradually adding to this till at weaning they are getting ½lb. of meat-meal and 1½lb. grain per pig each day.

Amounts for weaned pigs:

For weaned pigs keep the meal ration constant at 2lb. for two months after weaning, or until the pigs are 70 to 80lb. live-weight. Let them have, in addition, apples, roots, or grazing. as much as they will eat, increasing from nothing at weaning till they are getting 4 to 6lb. at 4 months old.

After this stage the meal can be reduced to ½lb. meat-meal daily per pig, and apples, roots, etc., increased to make up for the withdrawal of meal, and to allow for increased growth of the pigs. Pigs will fatten on ½lb. of meat-meal and 1lb. of barley along with apples. When pigs are 160lb. live-weight it is generally



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(No. 103)

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*This bulletin is obtainable free from offices of the Department of Agriculture at Auckland, Wellington, Christchurch and Dunedin.

advisable to increase the grain or meal portion for the last three weeks of finishing off. Up to 3lb. of meal daily is advisable.

The ages, weights, and daily feed requirements from weaning to bacon are set out in the table below:—

Table of Weight for Age and Feed Required Daily by Pigs of Different Weights.

	Age, in Weeks. lb.	Live-Weight. lb.	Feed Daily. lb.	Meat-meal. lb.	Supplied as Grain. lb.	*Apples. lb.
Weaner ..	8	35	2	½	1½	—
	12	55	2½	½	1½	2
	16	80	3	½	1½	4
	20	105	4	½	1½	14
Porker ..	24	130	4¾	½	1½	17
	28	160	5½	½	1½	20
Baconer ..	32	200	6	½	2-3	14

* Equivalent quantities of roots, grass, etc., may be used to replace apples.

This table is only a rough guide, and should be used only as a check when pigs are not thriving or growing up to expectations. Sound feeding is based on observation. Give pigs as much apple or other bulk feed as they will readily clean up.

Total Year's Supply

The feed supply for a sow and 14 baconers will be about 14,200lb. yearly, consisting of apples and other fruit (windfalls and rejects), grass or grazing, and a small area of any root or fodder crop, sugar beet, mangolds, carrots, etc., when apples are not available, house scraps, and a constant supplement of meat-meal, with additional grain when grass replaces apples or roots. Of this amount the sow uses about 3,000lb.; the rest is used after weaning, at the rate of about 800lb. per baconer. The whole feed supply might be made up of:—

900 cases of apples, 40lb.—9,000lb. feed; 1¾ tons bought meals—4,000lb. feed; 7-10 tons roots or grass (¼ to ½ acre roots, plus grazing)—1,420lb. feed.

The average number of pigs weaned per litter is 7½. If two such litters are fattened per year, then a corresponding increase in feed is required, to the extent of 800lb. per pig. If the main feed increase is farm-produced, profits are increased accordingly. No-one can predict how many pigs any particular sow will rear per litter. A small litter may necessitate the purchase of weaners, a large one the sale of some, so as to adjust pig numbers to the feed available. In general, the greater the number of pigs sold per sow the greater the profits. The New Zealand average for the past season was 9. Twelve per sow is attainable by anyone; 16 per sow is the ideal that makes profits very real.

At least half a ton of meat-meal and 15 bushels of barley should be used for the sow and the litter farrowed in December (sold as baconers in July-August); half a ton of meat-meal and 20 bushels of barley for the sow and litter farrowed in June (sold in March-April). Bought feed, worth about £20 to £25, should be required to produce £60 to £70 worth of baconers. The skim-milk from a cow would reduce the purchased feed by a quarter of a ton.

Minor Details

There is a number of minor difficulties, such as purchase of breeding stock, boar service, and provision of meals in some districts. Breeding sows can probably be obtained from suitable baconers now ready for slaughter. Boars require at least a ton and a half of feed per year, so that it is out of the question for every orchardist to keep a boar. The ton and a half of feed should return £18 worth of saleable meat. If arrangements could be made for the keeping of one boar to every 30 sows, and the owner of the boar were to receive 5/- for service and half-a-crown per week for the three weeks sows may be kept on his place, an adequate and fair service could be provided. These and many other would-be difficulties can be overcome by reasonable and business-like co-operation.

No Harm to Orchards

Men who have had pigs in their orchards now for a number of years say that the pigs do no harm to the trees, and perform a useful service in picking up windfalls, thus reducing the incidence of orchard pests. Where rooting is not desirable pigs must be rung. The idea that rooting can be

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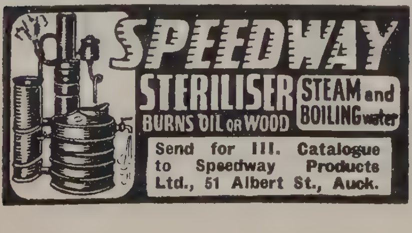
prevented by correct feeding is not sound.

Some orchardists do not like the idea of feeding young pigs on apples. Young pigs are very sensitive to the quality of the feed they get, and will not stand abuse. The possibility of immature windfalls doing harm to the pigs has been considered, and it is pointed out that provided the pigs get a foundation of 2lb. of good feed daily at all times after weaning up to 4 months old, there will be no harmful effects from immature fruit. Pigs over 4 months old, provided they get ½lb. of meat-meal daily, will also grow quite satisfactorily.

Purchased Stores v. Sows

Because apples and fruit are available when milk is going off, it is suggested that orchardists purchase weaners and stores from dairy-farmers where possible, and feed them on to bacon or to heavier store weights. This avoids the necessity of growing crops when apples are not available, and while it appears to have much to recommend it, there are drawbacks. Store pigs seldom are sold until the feed supply runs out, and the pigs have usually been on short commons for a while. It takes a while to get them accustomed to a new feed supply, and to recondition them. They seldom grow as well as home-produced pigs. Returns are in keeping with the amount of effort spent by the individual, and the buying of stores reduces the need for effort. Men who base the ability of pigs to thrive on the performance of store pigs accept a very low level of pig performance. Pigs react as no other animals do to continuity both of treatment and of feed quality. This can be given to home-bred pigs, and the value of it has to be experienced to be appreciated. Those who have insufficient apples or fruit to produce two litters of bacon could either grow more root crops or produce some bacon and pork, or even some pork and weaners, and, instead of depending on dairy-farmers' surplus pigs, turn the tables and sell surplus pigs to dairy-farmers in spring, when the apples are finished and when weaners are at a high price. However tempting it looks, keep off the store market as a buyer, especially when you are going to put pigs on a new, and in some respects, inferior diet.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Waste Fruit at Central Depot

Another point is the possibility of supplying waste fruit to those already keeping pigs. Provided that the user does not have to pay more than 1d. to 2d. per case for fruit delivered on his place, waste fruit could be disposed of in this way. A sow on an orchard gets a good deal of her year's supply from house scraps and sources other than waste fruit, and therein lies the profit from keeping a sow.

Pig Industry Broadcasts

UNDER the auspices of District Pig Councils broadcasts will be delivered in June as follows:—

Auckland, 1YA.—On June 20, at 7.15 p.m., "Feeding Pigs up to Four Months," by H. N. Preston, Supervisor, Northland District Pig Council.

Dunedin, 4YA.—On June 11, at 7.15 p.m., "Whey Feeding," by N. McDonald, Supervisor, Otago and Southland District Pig Council.

Napier, 2YH.—On June 14, at 7.15 p.m., "Conversation with Meat Inspector—Meat Inspection," by I. H. Owtram, Supervisor, Tairawhiti District Pig Council.

Palmerston North, 2ZA.—On June 19, at 7 p.m., "Crops to Grow for Winter," by L. L. Marsdon, Supervisor, Wellington District Pig Council.

Slaughterings of Stock

THE following returns of slaughterings of stock at meat-export slaughter-houses and abattoirs for the months May, 1944, to March, 1945, have been compiled by the Livestock Division:—

District.	Cattle.	Calves.	Sheep.	Of which Ewes were	Lambs.	Pigs.
North Island.						
Meat-export Slaughterhouses—						
Auckland	163,192	563,866	509,030	355,232	1,518,256	291,814
Poverty Bay-Hawke's Bay	47,466	47,108	689,805	391,694	1,466,471	27,286
Taranaki-Manawatu ..	67,117	205,309	419,338	312,048	1,426,392	133,652
Wairarapa-Wellington ..	28,189	19,230	350,335	199,078	935,718	28,222
Totals	305,964	835,513	1,968,508	1,258,052	5,346,837	480,974
Abattoirs	105,005	26,293	511,580	149,834	109,189	51,917
North Island Totals ..	410,969	861,806	2,480,088	1,407,886	5,456,026	532,891
South Island.						
Meat-export Slaughterhouses—						
Nelson-Marlborough ..	1,461	10,023	29,734	20,267	167,674	14,283
Canterbury	12,714	36,893	371,639	308,416	1,631,706	34,032
Otago-Southland	11,619	32,183	361,775	335,118	2,126,141	5,695
Totals	25,794	79,099	763,148	663,801	3,925,521	54,010
Abattoirs	47,169	8,491	235,140	118,033	52,559	11,584
South Island Totals ..	72,963	87,590	998,288	781,834	3,978,080	65,594
Dominion.						
Meat-expt. Slaugherhouses	331,758	914,612	2,731,656	1,921,853	9,272,358	534,984
Abattoirs	152,174	34,784	746,720	267,867	161,748	63,501
GRAND TOTALS ..	483,932	949,396	3,478,376	2,189,720	9,434,106	598,485
Same Period, 1943-44— Meat-export slaughter-houses and abattoirs ..	528,831	1,021,171	3,248,312	2,162,215	9,077,337	582,434
Same Period, 1942-43— Meat-export slaughter-houses and abattoirs ..	527,326	1,011,694	2,348,226	1,564,206	8,089,665	570,663

Slaughterings of Pigs

The 97,321 pigs slaughtered at meat-export slaughterhouses and abattoirs during the month of March, 1945, were distributed in weight ranges as follows:—

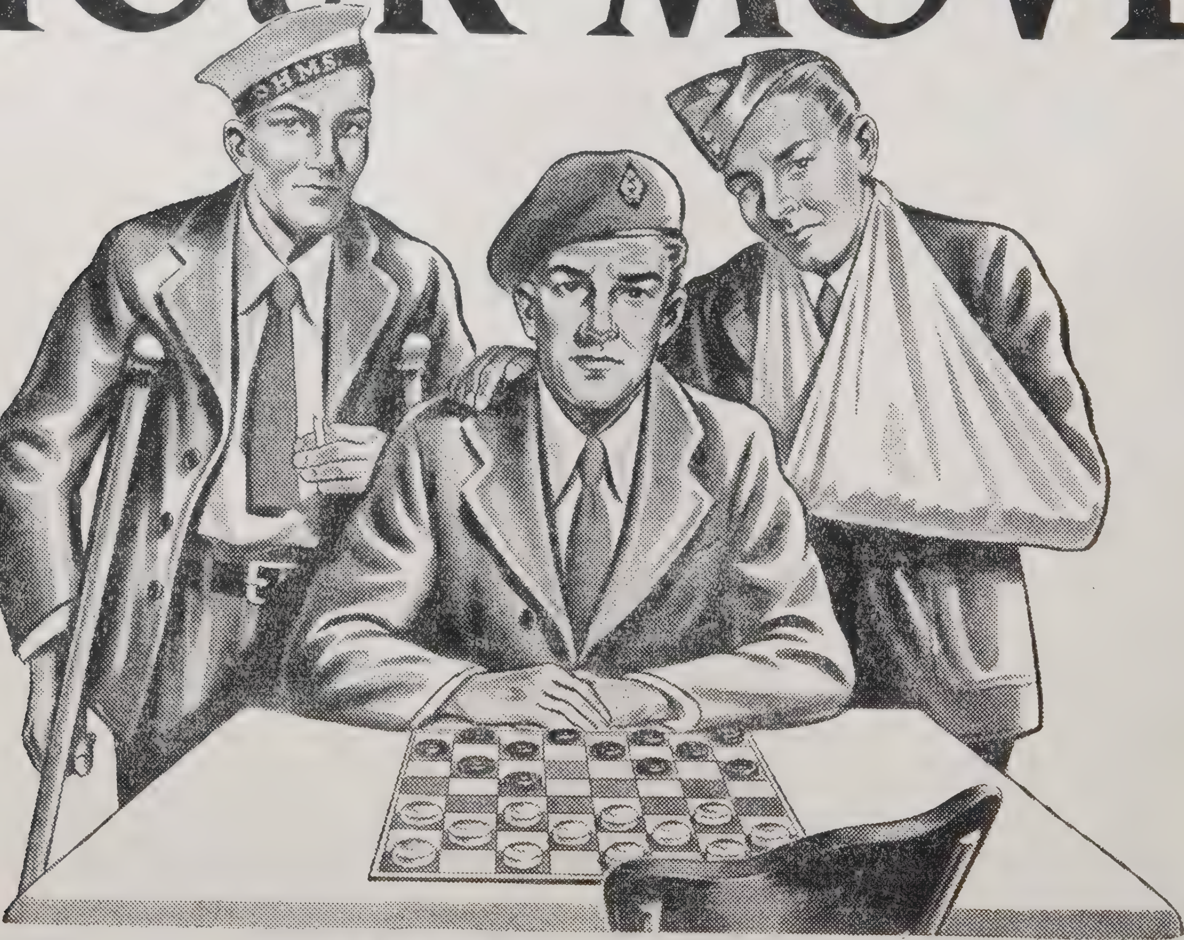
Up to 60lb.	369
60 to 120lb.	27,327
121 to 160lb.	46,101
161 to 175lb.	15,938
176 to 185lb.	3,131
186 to 200lb.	1,390
Over 200lb.	3,065
Total	97,321

The grading of porkers was:—
94 per cent. of 1st quality,
6 per cent. 2nd quality; and that of baconers was:—
83 per cent. of prime 1's,
13 per cent. of prime 2's, and
4 per cent. of 2nd quality.

In the different weight ranges the grading was as follows:—

	Prime 1's.	*Prime 2's.*	*2nd quality.*
121-160lb.	87 per cent.	10 per cent.	3 per cent.
161-175lb.	74 " "	21 " "	5 " "
176-185lb.	71 " "	22 " "	7 " "
186-200lb.	75 " "	16 " "	9 " "

YOUR MOVE



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VETERINARY NOTES

Foul-in-the-foot of Dairy Cows

FOUL-in-the-foot is one of the most serious types of lameness affecting dairy cows. It is due to the infection of small wounds in the vicinity of the foot by a common germ, the *bacillus necrophorus*.

Features of this organism are:—

1. It grows best in the absence of air (oxygen); hence is most active in closed protected situations.
2. It forms a powerful toxin, leading to the death of surrounding tissues; thus, there is always a core or area of dead, decaying tissue present.

Symptoms

The symptoms are obvious—first marked lameness and pain, then swelling of the parts just round top of the hoof, and later breaking of the skin between the toes. If relief is not promptly obtained there is general disturbance, reduction of milk, failure of appetite, and marked loss of condition; sometimes after the skin breaks a core of dead tissue separates, pus escapes, and relief is obtained, lameness becomes less and general symptoms subside; sometimes the swelling persists. Infection may enter one of the small joints of the toe or a tendon sheath, and the case drags on for months.

Treatment

In the first place, every cow showing lameness should at once have the foot of affected limb thoroughly cleaned out and washed or soaked in a suitable antiseptic unless there is another obvious cause of lameness. Frequently this may prevent further developments. Should swelling appear round coronet and no relief occur in twenty-four hours, a strong antiseptic applied to skin between toes may hasten opening of tissues and separation of the dead core.

One may apply a small pad soaked in pure Jeyes' fluid, bandaged in place between the toes for twenty-four hours, or rub in a little 1 in 8 biniodide of mercury ointment. Once the dead core comes away a tar bandage can be applied, and the case usually goes on quite well. In more persistent cases prolonged soaking in warm solution of Condy's crystals, teaspoonful to three pints, or chloride of lime at the same strength, can be tried.

Between treatments the foot should be kept clean and dry, and poulticing is not desirable. The cow should be kept where much travelling or entrance to dirty yards can be avoided and feed and water are available without exertion.

Should the disease process localise in one of the small toe joints and veterinary assistance be available, the toe may be amputated which cuts the case much shorter and prevents further loss of condition.

Causes

The conditions under which this trouble is most often met are where approaches to shed are filthy, thus both harbouring the germ and keeping the feet soft, and where, in addition, cows have to travel over material likely to cause minor foot injuries, such as sharp metal chips, coarse rough stones, broken concrete, manuka fascines, stumps, etc.

While it is mainly a disease of the spring and of muddy conditions it may appear during dry weather, but, if so, factors leading to foot injuries must be operating, and it must be admitted that the organism may remain alive for weeks in moderately dry soil or even in dust.

Preventive Measures

In view of the loss which may occur, prevention is important. Should cases occur, clean up dirty approaches and gateways and lime such areas heavily. To avoid dirty gateways or alleyways it may be necessary to make a new temporary approach to the shed.

Do away with possible causes of foot injury already named.

In some sheds where infection has continued to recur a footbath containing bluestone, through which cows walk when entering the shed, has been found beneficial.

Mortality in Lambs Grazed on Linen Flax Straw

A CASE has recently been reported of considerable mortality in a line of about 1,000 lambs running on rape with access to an area of linseed flax which had been headed and carried the fibre only and a similar area of threshed pea straw. Deaths commenced about eight days after the lambs went on the block. They were then moved on to pasture and the linseed ploughed in. Deaths continued to occur up till nearly three weeks after removal from the linseed fibre, and close on 100 lambs were lost.

Post-mortem examinations revealed the paunch or first stomach packed with a mass of the linen flax fibre, and deaths were apparently due to a form of starvation from the inability of the animal to take in other food material. The flax fibre would resist digestion for a long period. Treatment was not attempted as nothing less than a surgical operation for the removal of the mass could have been of benefit.

This note is put forward to indicate the possible risk attached to the grazing of lambs on such feed. The fibre stalks were apparently attractive to the lambs, and a similar result might be possible with older sheep, or even with cattle.

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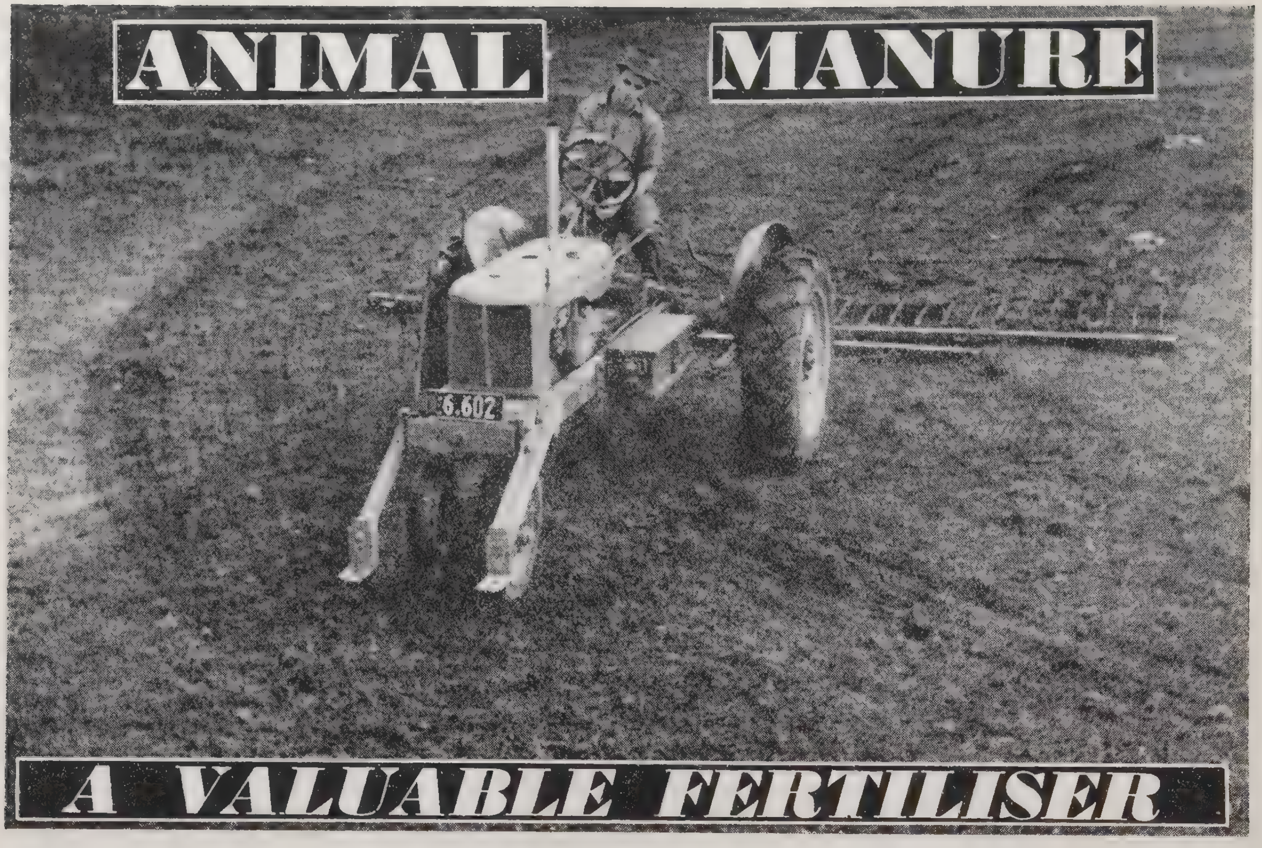


ANIMAL MANURE

A VALUABLE FERTILISER

★ Owing to the shortage of artificial fertilisers, no opportunity of using substitutes should be missed.

★ Tons of valuable fertiliser material are lying around most dairy farms and should be used.

★ Grassland harrowing in the late autumn distributes this manure, which then becomes a pasture asset instead of a liability.

SEASONAL NOTES

Winter Feeding of Stock

A GOOD reserve for ample winter feed is invariably a feature of the most highly productive farms. Shortage of feed limits the winter carrying capacity, while reliance on poor quality, badly balanced winter rations is a common cause of low production among dairy herds and high mortality with ewes and lambs. Semi-starvation of farm animals over the winter is not uncommon, and the lack of sufficient winter feed is a definite weakness in farm management.

The coarse winter fodders, such as hay and ensilage, are highly nutritious and digestible when of good quality and when fed as properly balanced rations. If inferior roughages, such as mouldy hay or poor ensilage, straw, pithy or diseased roots, are fed to stock, they will not constitute a proper maintenance ration, and will lead to malnutrition, digestive troubles and a lowering of natural resistance to disease. This applies particularly to dairy heifers, hoggets, and wet stock.

Digestibility

Unlike plants, animals must extract the nutriment after swallowing, and the indigestible portion has to be emitted. Consequently, unsuitable feed is a menace to the health of stock. Digestibility depends on the food itself and on the animal consuming it. For example, ruminant animals may be able to digest about half the fibre in their food, while horses and pigs digest only a small portion. Digestion in animals is a very slow process, taking three or four days at least. Good, clean drinking water aids digestion and should always be available.

Bulk in the Ration

All animals, especially ruminants, require bulk in their ration, but too much is risky. If feed is too concentrated, lack of bulk upsets the action of the digestive juices. If feed is too bulky the animal is unable to eat enough to obtain the necessary nourishment. For instance, a ewe, which is unable to consume more than about 30lb. of dry matter weekly, would require 85lb. of wheat straw or 50lb. of oat or barley straw or 50lb. of very poor hay as a bare maintenance ration. As this is beyond her capacity, she must suffer from malnutrition.

Balance the Feed Ration

For economic and safe feeding the necessary balancing of the winter ration with regard to the proportion of protein to carbohydrate must be taken into account.

Flesh, blood, and wool contain a high proportion of nitrogen. This is the important element in protein but not in carbohydrate, which includes the sugars and starch in the feed and supplies heat and energy. Young animals require more protein and less bulk in feed than mature animals; dairy cows a higher proportion than dry cattle; working horses require extra protein. Good meadow and lucerne hay are relatively high in protein, which largely accounts for their very great value as feed during the winter when little grass is available. Good pasture is a balanced ration and has about 75 per cent. of water, while roots, containing sugars, have about 90 per cent. water and hay about 15 per cent. Roots and good hay form a well balanced ration in nutritive properties, bulk and water-content. Although the autumn has been good for pasture growth, much hay is of inferior quality due to weathering and will increase difficulties of feeding for those unfortunate enough to be largely dependent on such feed, especially if an early or a prolonged winter is experienced.

Use of Poorer Quality Feed

Poor quality hay or ensilage should be reserved for the dry stock, but if required for wet stock, these fodders should be fed out early when the needs of the animals are least and before growth in pastures becomes too meagre.

Stock which enter the winter in a healthy condition are more easily maintained, but when vitality is low some difficulty must be expected in effecting improvement at this season of the year.

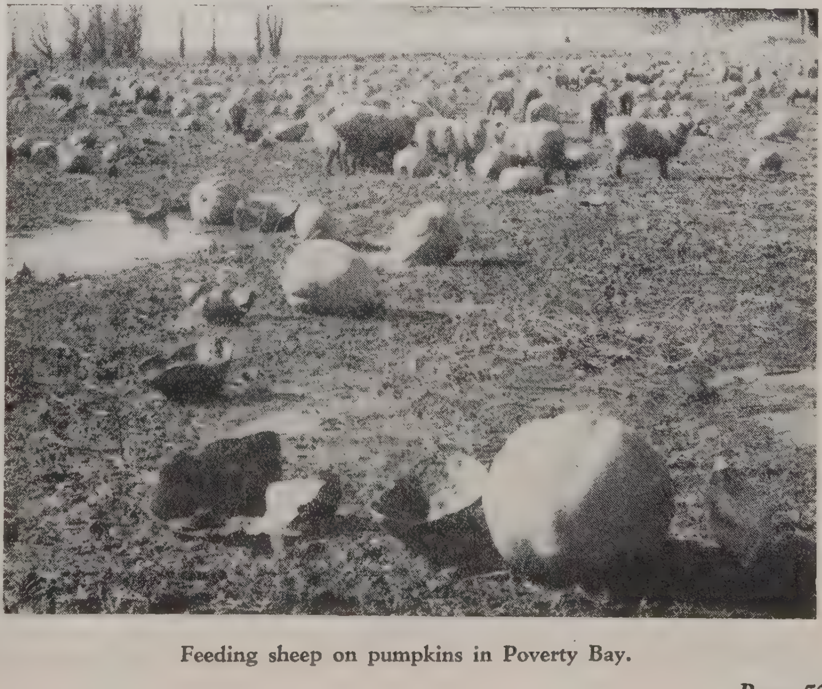
Aim of Winter Feeding

The tendency in winter feeding wet stock should be to improve gradually and consistently the quality and quantity of the feed as pregnancy progresses without sudden changes in diet or breaks in continuity of feeding. Further, it is well to husband winter growth of grass for lambing or calving periods and make good use of special fodders, such as Italian ryegrass and red clover or greenfeed oats and barley, in the late winter and early spring periods to stimulate milk flow and growth.

FEEDING THE DAIRY HERD.

The dairy cows are usually dried off during May, and an early start should be made with a winter feeding programme liberal enough to build up reserves for calving and for the next lactation period.

Unless sufficiently fed over the winter a cow will have to draw on



Feeding sheep on pumpkins in Poverty Bay.

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her reserves to live while producing a calf and at the same time contend with severe weather conditions. It is well known that cows in poor condition at calving time put on flesh first instead of milk into the bucket, and that their peak production instead of being reached in about six weeks may take up to three months. A maintenance ration for an in-calf dairy cow is in the vicinity of 12lb. to 15lb. of good lucerne or pasture hay with at least 40lb. of roots. These quantities are approximately equivalent to 50lb. of good ensilage, which should be fed with a hay ration. The quantity of the latter will depend on the quality of the ensilage. Heavier feeding for good producing cows should be practised if the reserve is large enough. An allowance of greenfeed, such as chou moellier carted out or rationed green oats or barley and saved winter grass, affords valuable additions to diet and a welcome change. The use of ensilage as a winter feed has gained some prominence in the North Island, but is less general in the South. If not required for winter feed, ensilage is excellent as a dry summer supplement and will keep for a number of years until required.

Sufficient good hay will be of considerable value in bringing the cows through the winter and in balancing the early spring greenfeed oats or barley ration. In feeding out hay or mangolds, the hay should first be spread out thinly in dry paddocks, and only after this is partly consumed should the roots be carted out. This practice will aid digestion while avoiding the consumption of half-frozen roots on an empty stomach. Cattle pumpkins grown in the warmer districts may be carted out on to the paddocks when convenient, and sufficient can be split in a few minutes for the day's requirements. As pumpkins do not keep well they are invariably fed out before mangolds which, for cows, require pitting for at least six weeks before consumption. Pumpkins are utilised with greater profit by the pigs on the dairy farm, but are largely grown for sheep in the northerly districts.

WINTER FEEDING OF SHEEP.

Winter feeding of sheep is required in some districts during the coming month, while in all districts it will be necessary over the next three months and into September. It is impossible to lay down any definite system of winter feeding, but it is false economy to winter stock with insufficient supplies, and some purchases in addition to home-grown crops may be profitable in some cases. Any break in the continuity of feed is liable to affect wool and carcass and may have serious effects on hoggets and breeding ewes.

The needs of the breeding ewe will increase as the lambing season is approached. At the present time ewes in lamb should be in reasonable condition, and supplementary feeding should be commenced before there is a tendency to lose condition. About 80 per cent. of pre-foetal development of the unborn lamb takes place during the last six weeks of pregnancy, and extra feeding over this period is essential.

In the wintering of sheep the main supplementary crops are greenfeed, turnips, swedes, chaff, hay, or ensilage, depending on ease of production under local conditions.

The growing of greenfeed cereals and Italian ryegrass has increased at the expense of the turnip crop, particularly on lighter, drier country in the south. Both are fed off in breaks of sufficient size for several days' grazing. In the moister districts of the south swedes supplemented by hay or chaff are largely relied on. During the present autumn, club root has greatly reduced yields in these crops. A 40-ton crop of swedes is regarded as sufficient to winter 15 ewes for 100 days for about a two-hour grazing period daily except under frosted conditions, when the roots should not be stocked. To balance the swede ration one sack of oat sheaf chaff, preferably sprinkled with molasses, is needed for 100 ewes, or double this quantity if the roots are not available due to frost or snow. A ration of 2lb. per day of good hay or oat sheaf chaff on bare paddocks will keep sheep from losing weight.

Poor quality roughage, such as straw, in the ration requires supplementing with grain or good hay. There is no advantage in crushing the grain except for failing-mouth ewes, but gorging must be prevented. This is overcome by feeding with chaff in troughs, allowing a space of 9in. per sheep at the feeders. Supplies of good quality lucerne, clover or grass hay are hard to replace and make for economic feeding of all roots and greenfeed cereals over the winter to early spring period.

—E. M. BATES, Instructor in Agriculture, Alexandra.

Sprouted Wheat for Seed Purposes

BECAUSE of the very large proportion of sprouted grain in many lines of this season's wheat, great care will have to be exercised in connection with the selection of seed wheat for the coming season. It is doubtful whether there are sufficient lines of first-class seed available to ensure the sowing of the 300,000-acre target for 1945-46, and in all probability some lines containing sprouted seed will have to be used. This will not be a serious disadvantage, provided farmers obtain a report on the doubtful lines and increase the rate of sowing to ensure that sufficient satisfactory seed is sown to give a good braird.

The Seed Testing Station of the Department of Agriculture has arranged a service whereby any farmer wishing to have his seed wheat tested can obtain a report on the line, and farmers generally are advised to send samples representative of the line to the Seed Testing Station, Department of Agriculture, Palmerston North.

Experience has shown that a mere germination test is not sufficient and may give a wrong impression of the value of a line of seed wheat. Speed of germination and high vitality are the essential features of good seed wheat, and the test to which samples submitted by farmers will be put will cover these points.

Growth Groupings

To provide a workable basis for the evaluation of wheat for seeding, the total growth of samples under test will be grouped into four classes:

A. Seedlings of high vitality and germination speed: First-class seed.

B. Seedlings of lower but fair vitality, and/or of slower germination speed: Fair-average seed.

C. Seedlings of low vitality and of slow germination: Low-grade seed.

Certified Pasture Seeds

APPLICATIONS BEING ACCEPTED

APPLICATIONS for the following Certified Government Stock grass and clover seeds are at present being accepted by the Department of Agriculture:—

Perennial ryegrass
Italian ryegrass
H1 ryegrass
White clover
Montgomery red clover.

Applications for these seeds should be forwarded through any mercantile firm to reach the Director of the Fields Division, Department of Agriculture, Box 3004, Wellington, not later than June 30, 1945.

Full details of the conditions governing application for these seeds were published in the March, 1943, issue of the "Journal of Agriculture."

D. Seedlings very weak and abnormal: Valueless as seed.

This grading of seedlings will be carried out at specific stages in the test, and with the use of controls of known standard.

From this the farmer will know just what percentage of seed within the sample will come into each grade, and his sowing can be adjusted accordingly. Where the sowing is carried out under ideal conditions it is considered that the seed in the line shown in classes A, B, and up to half of C will germinate and establish in the field. If the sowing conditions are only fair, it should be reckoned that only A and B will establish, and where the conditions are definitely unfavourable farmers should reckon on only that proportion of the line classed A establishing.

For obvious reasons—in particular the existence of a very wide range of sowing conditions—a fine degree of precision cannot be expected of this service. Nevertheless, it is hoped that it will at least provide a useful guide to the selection of seed wheat from partially-deteriorated lines.

Owing to the lateness of the season, it is going to be extremely difficult to reach the production target as far as autumn sowing is concerned, so that every endeavour should be made to ensure a maximum yield from the actual acreage sown; to do this farmers must ascertain the quality of the seed being sown and adjust the rate of sowing in accordance with that quality.

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Repairs to Fences

REPAIRS to permanent fences and gates should be undertaken as soon as possbile in readiness for the coming season. Timely repairs save expense, time, and temper and entail less work.

Fences are often in disrepair by the winter, but if well erected little maintenance may be required other than the tightening of wires, replacement of staples, and general attention to posts and battens. Posts which are showing decay at ground level may be reversed. Stock-proof fences are essential for efficiency, but when left in a state of disrepair they allow stock to damage crops and may cause injury to livestock.

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Box 66, Petone.

A subdivision fence left high and dry by a slip.

With the shortage of labour and the advent of the busy stock period, no time may be available later to carry out the necessary repairs.

Subdivision

Closer subdivision usually results in better utilisation of pasture. Much may be done with temporary subdivision, especially on the dairy farm, with electric fences and a few standards. Many have found even one plain wire satisfactory for confining dairy cattle and horses, for the protection of haystacks, and for feeding off crops and pasture in breaks. The electric fence is less satisfactory for sheep or pigs, although it has been used fairly extensively for such stock. In general, barbed wire is more effective than plain wire, but owing to damage to wool plain wire is usually preferred for sheep. Usually three wires are used, and they have been found sufficient once the sheep become accustomed to electric fences. After a period the current may be switched off even for several days without the stock breaking through.

Electric fences are liable to "earth" when snow is on the ground or if wet herbage makes contact between the wires and the ground. Machines giving a double shock are preferred to the single shock type.

Preserving Fencing Timber

Preservative treatment with creosote allows timbers which were hitherto regarded as unsuitable to be used for fencing purposes. Before being treated such timber should be winter seasoned to reduce splitting. Coal tar and soluble mineral salts are not recommended as fencing post preservatives. Green timber posts are considered slightly more durable than untreated seasoned posts, as there is less tendency to split at ground level, a condition which favours decay.

General

In erecting new fence lines on hill country which is liable to erosion subsequent maintenance may be reduced if the fences are made to follow ridges and spurs rather than sidelings.

The general layout of existing fences on the farm should also be considered, as much improvement may be possible with little or no additional material by straightening fence lines and altering fences to more suitable positions.

In all cases fencing must be studied in relation to the water supplies available.

The high cost of fencing and shortage of materials have been serious drawbacks to the erection of new permanent fences during the last few years, and many farmers are overcoming this difficulty by constructing their own reinforced concrete strainers and posts on their properties.

Those interested should obtain the free bulletin No. 184 "Concrete on the Farm" issued by the Department of Agriculture.

E. M. BATES, Instructor in Agriculture, Alexandra.

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ORCHARD AND VINEYARD

Pruning Stone Fruits

HARVESTING operations for the 1945 season will by now have been almost completed. There will probably still be a few late varieties to harvest, and these should be picked at the earliest opportunity. The importance of careful handling of these late varieties cannot be too greatly stressed, as the bulk of this fruit will be required for long cool storage and orchard storage to supply the market late in the year. If it is not handled carefully in picking, grading, and packing the keeping quality may be seriously impaired.

When the handling of the crop has been completed no time should be lost in starting the pruning of pip and stone fruit trees. Unless an early start is made and full advantage taken of fine weather the work may become so protracted as to hinder some of the essential spring work, such as ploughing, cultivation and spraying. In recent years when there has been a shortage of experienced labour pruning operations frequently have to be rushed, with the result that in some cases pruning is not properly done and the growing and cropping habits of the trees are adversely affected.

When pruning, growers should bear in mind that the best tree is one that will produce the greatest quantity of good quality fruit at a minimum cost. No hard and fast rule can be laid down in regard to pruning, and growers must exercise their own judgment when dealing with individual trees.

Peaches and Nectarines

In mixed orchards pruning begins with stone fruit, and as the growth and fruiting laterals of the peach and nectarine are similar the same method of pruning is applicable to both. As fruit is produced on one-year-old wood, a fairly heavy pruning is required each winter to encourage an ample supply of new fruit-bearing wood for the following season. This can best be obtained by a judicious thinning out during the pruning season and by suppressing entirely many of the stronger laterals in order to induce further development of new growth.

For shorter and weaker laterals, a detailed treatment is required to regulate the crop and force new shoots. It is always preferable to retain the well-ripened, short, stocky laterals rather than the slender, soft shoots for fruiting. Much time can be saved during the thinning period by extensively removing laterals so that not more than a moderate blossoming will occur. Unless properly pruned, both peaches and nectarines will bear higher each year, leaving unfurnished, non-fruiting branches in the lower framework.

Apricots

Apricot trees produce the bulk of their fruit on fruit spurs which are short-lived, but a small proportion of the crop is produced on one-year-old shoots. Every season long and heavy lateral growth should be shortened to within a few buds of the base. Short laterals and fruit spurs need not be touched until after bearing, when they should be cut back to encourage a further supply of fruiting wood. As the tree ages, a severe cutting back and thinning out will be necessary if only short growth is being produced from the usual system of pruning.

Cherries

As cherries are produced on long-lived spurs, less renewal of fruiting wood is required. When the tree has become established and cropping begins very little pruning is necessary to maintain it in a state of production. As most of the new growth is from terminal buds, there is a tendency to develop long leaders unless heading back is resorted to. Only moderate cutting back of leaders is necessary for the first few years or until the framework of the tree is completed. Cutting back after this will merely cause delay in fruiting, as hard cutting will encourage shoot-growth and make fruit-spur development impossible. It is essential to maintain the soil in proper condition to keep the trees in a good state of vigour, and weak trees cannot be brought back to a vigorous state of growth by pruning alone. Soil conditions must be improved at the same time.

Japanese Plums

Japanese plums are produced on short, thick spurs, mostly on wood two years and older, but a small proportion of the crop is produced on strong one-year-old wood. This variety is a very prolific bearer and requires heavy thinning to obtain a size suitable for marketing. Heavy pruning should be resorted to each year to reduce the number of fruits and to encourage sufficient new growth. It should consist of a general thinning out by the removal of most of the one-year-old shoots and by shortening many of the two-year and older shoots.

European Plums

Unlike Japanese plums, European varieties do not tend to over-produce. Therefore, a lighter pruning to encourage bud-production is required, instead of a heavy pruning to reduce the amount of fruit-producing spurs. Actually, the pruning required would consist mainly of the removal of exhausted wood and broken branches.

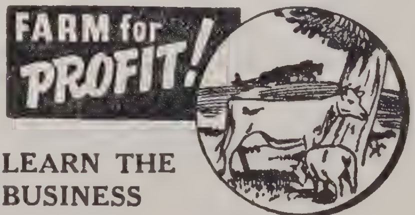
Dressing Wounds

Where it has been necessary to remove limbs because of breakages or over-crowding, all large wounds should be dressed to assist healing and to prevent the entry of silver blight or other organisms. This is particularly important with all varieties of stone-fruit trees. A bituminous paint is very suitable for this purpose.

—D. J. HOGG, Orchard Instructor, Mapua.

Cubic or Solid Measure

1,728 cub. in. (12in. x 12in. x 12in.) = 1 cub. ft.
27 cub. ft. (3ft. x 3ft. x 3ft.) = 1 cub. yd.
40 cub. ft. = 1 ton for shipping purposes.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Citrus Notes

Establishment of a Citrus Orchard

THE successful establishment of a citrus orchard is dependent on many factors, all of which should receive full attention if the best results are to be secured. Initial errors in the selection of site, soil, quality of tree, and root stock cannot be remedied after planting. Other factors which are likely seriously to militate against the success of an orchard if not given due attention at the appropriate time are time of planting, preparation of soil, drainage, provision of adequate shelter belts, selection of best variety and strain, and last, but not least, the area of the proposed orchard.

Land with a gentle slope to the north or north-east is best suited for citrus, although other aspects are at times satisfactory. Steep slopes should be avoided regardless of soil type, and any appreciable slope towards the prevailing wind, which will make the provision of adequate shelter difficult and expensive, should also be avoided. While citrus may thrive in many soil types, a porous clay loam with good natural drainage can be expected to give best results. Good drainage to a depth of about 3ft. is essential to success.

The most suitable months for the planting of citrus trees are June and July, although plantings made in August are at times satisfactory. An area which is too small to keep one man fully employed cannot be operated as economically as a larger orchard. The most satisfactory unit is believed to be an area of approximately five or six acres, containing 400 to 500 trees. There is a distinct advantage in keeping the number of varieties to a minimum, for small numbers of any one variety are more often a liability than an asset.

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Provision of Shelter

The provision of adequate shelter from the time the fruit trees are planted is an important factor in citrus culture. Citrus trees planted in exposed positions become severely stunted, make extremely poor growth, and frequently fail to make satisfactory growth even when adequate shelter is provided in later years. Shelter trees should be planted at least three years in advance of the orchard trees. The most suitable kind of shelter tree will depend mainly on soil type and topography of the area. Where a high shelter is not required the following are suggested:—*Hakea saligna, Cupressus lawsoniana, Cupressus benthamii,* giant bamboo (*Bambusa vulgaris*), or *Acmina floribunda.* Taller shelter may be provided by such trees as *Pinus insignis* or, in suitable soil types, Lombardy poplar. Where *Pinus insignis* is used it is also advisable, because of the tendency of mature pine trees to become bare of branches near ground level, to plant a parallel belt of low-growing trees about 8ft. distant from the pines.

Ordering of Trees

Trees for new plantings should be ordered as far in advance as possible; this is particularly important under present conditions, when the demand for trees is much in excess of the number available. The placing of orders at least two years in advance of requirements enables the nurseryman to bud trees in accordance with known requirements. The kind of root stock recommended for most varieties and localities is sweet orange, which appears to be more resistant to diseases of the trunk than citronelle, and also tends to prolong the profitable life of the tree. The dwarfing influence of *Poncirus trifoliate* makes this stock unsuitable for use in commercial orchards, except perhaps in a few exceptional circumstances. Trees should possess a clean, straight trunk not less than 2ft. 6in. in length and to assist in minimising losses from bark diseases in later years it is important that the bud union should be 1ft. or more above ground level.

As there are different strains of nearly all varieties of citrus, it is extremely important that trees should be propagated from the most suitable strain of the variety. It is sound commercial practice to purchase the trees one year before planting out is contemplated. The trees should be set out in nursery rows in a well-sheltered position adjacent to the area to be planted and the final planting can be made with the least possible check to the trees.

Trimming Shelter Belts

The trimming of shelter belts, other than bamboo and poplar, should be undertaken annually if the maximum benefit is to be secured. On reaching maturity many kinds of shelter trees tend to become devoid of foliage near ground level if annual trimmings are not commenced about two or three years after planting and regularly maintained. The extra work involved in trimming each year instead of every third or fourth year is considered to be fully offset by the reduction in labour necessitated by the disposal of large-sized trimmings. Hedges trimmed in early winter refurnish their foliage much earlier than when the trimming is done in late winter or early spring. When the interval between trimmings is greater than one year it is a distinct advantage to attend to this work not later than May, so that early refurnishing will provide the necessary protection in spring.

Care of Compost Heaps

To secure satisfactory results from compost heaps it is essential that the moisture content should be kept at approximately 80 per cent. of saturation. A simple method of determining the moisture content is described in the "Citrus Notes" of the November, 1944, issue of the "Journal." During winter and early spring compost heaps generally become excessively wet if fully exposed to the weather, and remain in such a condition throughout this period. In such cases the excess moisture greatly restricts the activity of beneficial soil organisms and may encourage the development of other soil organisms that are not beneficial to plant life. Excessively wet compost heaps should be protected from further rain by some suitable covering, such as corrugated iron, which should be supported a few inches above the heap to afford ventilation. The covering may require to be removed for periods to prevent excess drying out.

—*P. EVERETT, Orchard Instructor, Kaikohe.*

HOME GARDEN NOTES

Work for June

We can only work on our knees, bending our backs to accomplish something in this Divine workshop.—Chelsa C. Sherlock.

IN the quotation above inspiration for renewed effort in the vegetable garden during the coming season should be found. Preparations can be made in June for vegetable production in the period immediately ahead. It should not be forgotten that best results will always be obtained from a garden where a production plan is closely followed. No amount of chance or haphazard effort can ever equal the results of planned production.

Potatoes

When the variety of potato it is intended to grow has been decided on seed should be obtained as early as possible and placed in shallow boxes to sprout. Ordinary seedling boxes are very suitable, in which the seed tubers should be placed "rose" end up. In this position the shoots will grow straight, and, provided the storage conditions are right, will be healthy and vigorous. Plenty of light and good air circulation are necessary to encourage the production of sturdy growth. Darkness or excessive shade will produce weak, spindly shoots, which are liable to rot after planting.

It is not advisable to plant a relatively soft potato variety in areas badly infested with slugs. Tubers of this kind are often rendered unfit for table use by these soil pests, whereas harder varieties rarely suffer serious damage. Where previous crops of Sutton's Supreme have been badly affected by slugs it may be advisable to plant either Arran Chief or Arran Banner.

Cauliflower

In a small garden frame or under protection of some kind seed of an early variety of cauliflower can be sown. As only a relatively small number of plants will be required, the seed may be sown in a flower pot or small box which can be set in a porch. After germination and when the seedlings are about 2in. high they can be pricked out into boxes, which should be from 4½ to 6in. deep. This depth will allow for full development of the plant's tap root. Transplanting in rows is recommended. In raising cauliflower seedlings it should be remembered that they must never be subjected to conditions which will in any way check their growth. Many, if not all, disastrous summer crops of cauliflower can be traced to the plants having been checked during the early period of growth. Phenomenal Early or Early London are suitable varieties.

Lettuce

Seed for early harvesting of lettuce may also be sown during June, and the same precautions as recommended for cauliflower should be taken to ensure good germination. The seed may be broadcast sparsely and the plants grown without transplanting. If the seedlings appear to be crowded, they may be thinned out and set in another box. Success or Webb's Wonderful are varieties which can be recommended.

Rhubarb

Roots of rhubarb which bear their crops during spring and summer should not be permitted to remain in the same part of the garden for more than three years; four years is the limit. After this they should be removed, and June is the most appropriate time to dig them out. A sharp spade is the best garden tool to use, and with this the root should be encircled by deep thrusts to the full depth of the blade. The root can be lifted out, and most of the adhering soil removed by dropping it several times on the ground. Alongside a live hedge or wooden fence, where the roots will be exposed to rain but not to the sun or drying winds, will be a suitable place to store them until the time for dividing them before replanting. They should be placed on the ground, crowns upwards.

As the practice of pulling stalks from first-year plants cannot be recommended, it is not advisable to dig out all rhubarb roots in the same season. A continuity of supply is assured by retaining some of the older roots.

Asparagus

Having changed from its original green colour, all top growth of asparagus should now be removed. Cutting down, burning, and broadcasting the ashes over the bed, together with as much wood ashes as can be spared, will prevent germination of the ripened seed, and supply some potash for the roots. The bed should be thoroughly cleaned up, and all weeds turned under. This operation should be carried out with great care, as deep digging may injure many of the dormant buds which will produce next season's spears. Provided manure was applied as advised when harvesting was finished, no additional fertiliser will be required at the present time.

Savoy Cabbage

Beds of Savoy cabbage should not be neglected. Heavy applications of manure or fertiliser so late in the season will not be of much advantage. To slow-developing plants the best and quickest stimulant is a pinch of nitrate of soda applied in dry form round and close to the main stem. This should be worked into the soil either with a hoe or a small hand fork. The soil must not be disturbed to a greater depth than is necessary to cover the nitrate of soda.

Broccoli

Late-maturing varieties of broccoli still in the garden may be treated in much the same way as that recommended for Savoy cabbages. In addition, however, they should receive extra "banking" with soil to stabilise

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them against high winds. The weight of the head and heavy foliage is a disadvantage where high winds are frequent, particularly in light soils. Extra banking is necessary to prevent plants from being uprooted.

Leeks

Leeks should now be almost fully grown, but particular attention ought to be given to weeds, which grow luxuriantly during the moist weather of June, and flourish on the heavily-manured soil necessary for leeks. Keeping the bed clean will allow the plants full opportunity for development.

Spring Cabbage

Weeds and slugs are the worst enemies of spring cabbage during June. Burnt or hydrated lime applied along the rows and on the plants several nights in succession will usually destroy these garden pests. The lime should be applied only in the evening and not before the plants are clear of weeds. Applications of lime will not in any way injure the cabbage plants, and, long before harvesting, it will have been washed into the soil, where it will again serve a useful purpose. Additional fertiliser should be worked into the soil without delay where plants do not appear to be making normal growth. At the same time a pinch of nitrate of soda to each plant would be an advantage.

HYGIENE IN THE GARDEN.

If healthy, vigorous vegetables, with full nutritional value, are to be grown, observation of hygienic laws in the garden is just as necessary as in a community. That the danger of the spread of vegetable diseases from vegetables and other host plants is not fully appreciated is evident by the manner in which many crops are planted to follow each other. This applies equally to the commercial vegetable-grower as well as the home-gardener.

An outstanding example may be given by reference to the tomato disease known as "spotted wilt." This is a virus disease, and is stated to be spread by thrips, the particular species being *Frankliniella insularis.* According to the U.S.A. authorities Porter and MacGillivray, over one hundred species of plants have been found infected by the spotted wilt virus. These include common garden crops such as celery, spinach, lettuce, potatoes, peppers; also the following garden flowers: Calla lily, aster, nasturtium, cineraria, dahlia, and zinnia. Weeds, too, carry the thrips, and among these are nettle, chickweed, and wild lettuce. In certain tomato-growing districts the disease is responsible for heavy losses in commercial areas, as well as in private gardens. In a crop of such high economic importance, and where so much depends on bringing the full crop to maturity, strict observation of hygienic laws, so far as they relate to crop rotation and weed control, should be practised.

Destruction by burning of all diseased vegetable remains or trimmings is necessary to prevent the accumulation of injurious fungi and bacteria in the soil. If, however, composting is carried out in the correct manner, and sufficient heat germinated within the compost heap to destroy injurious fungi and bacteria, all kinds of plant remains or weeds may be composted without fear of harmful results from subsequent use of the compost.

—D. K. PRITCHARD, *Instructor in Vegetable Culture, Wellington.*

Temperature

Water boils at 212° Fahrenheit and freezes at 32° Fahrenheit or on the Centigrade scale boiling point is 100° C., and freezing point 0° C. Both the Fahrenheit and Centigrade scales are in common use, though the recording of temperatures in scientific investigations is usually made in degrees Centigrade. The New Zealand meteorological temperature records are, however, recorded on the Fahrenheit scale and every degree F. below 32°F., or freezing point, is reckoned as one degree of frost.

To convert a Fahrenheit reading to a Centigrade reading first subtract 32 then multiply the remainder by $\frac{5}{9}$ while to convert a Centigrade reading to a Fahrenheit reading multiply degrees Centigrade by $\frac{9}{5}$ then add 32.

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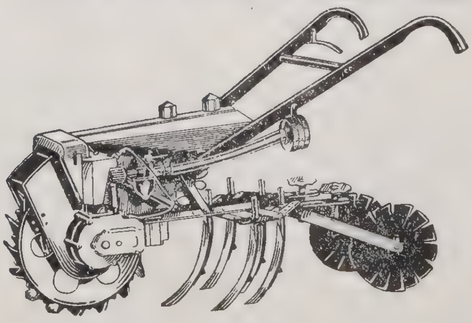

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NOTES FOR BEEKEEPERS

Larger Wax Moth Control

IN the past wax moths were regarded as only a pest to the careless and incompetent beekeeper. Now all beekeepers, especially those located in the milder districts of New Zealand, are compelled to take protective measures if they wish to preserve all their extracting combs against the ravages of the wax moth larvae. The size of next season's honey crop depends to a large extent on having an ample supply of drawn-out combs.

Loss of Extracting Combs

It is not uncommon to find each spring that beekeepers have lost a considerable number of their stock combs. Where the number runs into a hundred or so supers the loss is very considerable and can be assessed as follows:—

1. Combs generally are a complete loss. All wax is destroyed, so that it is not worth melting down the rubbish. As 10 combs would normally yield approximately 2½lb. of beeswax, valued at 2/- per lb., a substantial loss is shown in the loss of wax alone.

2. Considerable labour is required in cleaning the frames and making them ready for use again.

3. Most of the frames will need rewiring.

4. Frames have to be fitted with sheets of comb foundation; approximately 1¼lb. of 8 sheets to the lb. at the very lowest figure would cost 3/6 per super.

5. This foundation has to be drawn out by the bees before any honey can be stored in the new combs. In a season when the honey flow is of short duration a beekeeper with drawn-out combs will secure a crop, while a beekeeper with all foundation will find that by the time his combs are drawn out the honey flow will have begun to slacken off.

As a very substantial loss may therefore be incurred, beekeepers should take adequate precaution against any likelihood of comb destruction due to the wax moth larvae.

LARGER WAX MOTH.

As it is the larvae of the larger wax moth (*Galleria mellonella*) that cause the destruction of stored bee combs, this article will deal solely with the life cycle of this moth and the method of keeping it in check.

The nearly spherical, smooth, creamy-white eggs are deposited by the female moth in groups in cracks and crevices about the hives or combs, and only occasionally on open surfaces. Up to approximately 1,000 eggs may be laid by a single female during her life of about 10 days, and the minute eggs are very hard to see. The period of incubation varies with the season. In cool weather the eggs take about 21 days to hatch, while under summer conditions they take only from seven to 10 days. The resulting grubs or larvae are greyish-white and very active, and tunnel into the combs, spinning a silken gallery as they go. When early comb infection occurs these white, silken galleries can readily be seen close to the mid-rib, while at the end of this tunnel will be found the larva working its path of destruction. Older larvae are dirty grey in colour and quite plump, and may measure up to 1⅛in. long. The rate of development of the larvae depends on temperature and the amount of food available. The period of larvae growth may be as long as 28 days, and the damage that may be done during this lengthy period can readily be understood.

Pupation

Having completed their growth, the larvae seek places in which to pupate and then spin white cocoons, which are usually found grouped together under the hive mats or between the frames and sometimes on the floorboards. Before pupation they often gnaw shallow grooves in the wood in which to lie. Much hive material has been disfigured in this way, and is evidence of carelessness by the owner. The pupal period is approximately seven days.

Adult

The moths are about ¾in. long, and have a wing span of 1¼in. Shortage of food during the larval period may result in the hatching of much smaller moths, which are sometimes mistaken for the lesser wax moth (*Achroia griscella*). The larger wax moth is mottled brown to ashy-grey or purplish, turning to light silver grey with creamy-white underwings. The outer margin of the forewing of the male is deeply scalloped and fringed. The female moths soon mate, and can be seen hovering around the hives seeking a place to lay their eggs. If unable to gain access to a hive, they will seek out any inviting crevices as near to the wax as possible.

MEANS OF CONTROL.

In mild districts where wax moths are troublesome weak colonies of black bees very soon fall a prey. The Italianising of all black colonies will overcome the risk of established hives becoming infected, for wax moth larvae are seldom found in the combs of an Italian colony. As pieces of old comb lying around the apiary provide suitable breeding grounds, all old wax and pieces of comb should be placed in a covered drum and melted down at the first opportunity. Provided such precautions are taken, beekeepers in the colder districts may find that they have very little infection to worry about.

Storage of Honey Combs

In the past beekeepers relied on the use of tar derivatives such as paradichlorobenzene, moth balls, or naphthalene, to keep wax moths from their stored combs. Unfortunately,

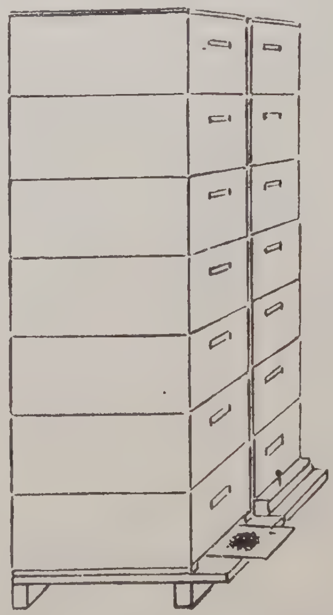

Fig. 1—Extracting combs, showing one pile ready to be treated with calcium cyanide and the other sealed up with entrance block.

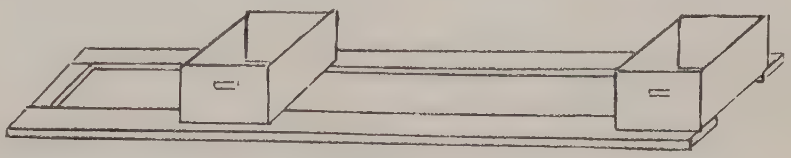

Fig. 2—Method of placing timber on floor before storing supers.

these chemicals give off a heavy, penetrating smell, which is absorbed by the combs, which, even after aeration before being placed on the hives in the late spring, have been responsible for imparting an off-flavour to the honey stored in them. To obviate this other means of protecting combs through the storage period are necessary. A suitable alternative is the use of calcium cyanide, a greyish powder or granules which, on exposure to the moisture in the air, release the powerful and deadly hydrocyanic gas. This chemical is available commercially, and has been used for many years in destroying diseased colonies prior to burning. It does not appear to contaminate the combs in any way, and makes short work of any larvae or moths in the supers.

Method of Use

Calcium cyanide should be placed so that the liberated gas may rise through the combs, and the supers should be stacked in piles on top of floor-boards as shown in Fig. 1. Where space is available piles may be arranged in rows with a small alley, the entrances of the floor-boards facing inwards. A sheet of paper with a wire screen or queen-rearing excluder should be placed on top of each pile. Place the required amount of calcium cyanide on a piece of cardboard or tin and quickly push it in the opening under the pile of combs. Then close the entrance with a wooden block which will fit neatly over the opening, and nail it to the floor. All windows and doors should be open while this is being done, but on completion the room should be shut up for 24 hours and no one allowed in until it has been thoroughly ventilated.

For beekeepers who have specially-built comb rooms, and in cases where the number of supers stored will not allow alleys to be left between the piles, the method shown in Fig. 2 may be used as an alternative. This enables gas to be given periodically and quickly to the combs with the least risk to the operator. Place strips of wood 3in. x 1in. along the floor of the shed to raise the supers from the floor and form a channel under each row. One end of this channel must coincide with an opening in the wall of the shed. Boards to go the full length of the channels under the supers should be marked in divisions, either 20in. or 16in., according to the way the supers are stacked. The method is shown in Fig. 3. Place the calcium cyanide on each marked division as the boards are being pushed in so that each heap of powder will come directly under a pile of combs. The opening can then be closed and the gas left to do its work. When a fresh application is desirable the boards are withdrawn and the process repeated.

Quantity to Use

Approximately 1oz. of calcium cyanide to a pile of 12 supers is the amount to use. A fresh application may be made in a month's time and repeated at intervals until the combs go out again. Experience with the gas will soon show how many applications are necessary during a season to immunise the combs against destruction.

Precautions

To use such an effective but deadly gas the operator should read thoroughly the pamphlet enclosed in each tin. Take particular notice of the antidotes and first aid recommended by the makers, but remember "prevention is better than cure." A wise precaution is never to use calcium cyanide in a building unless someone else is handy.

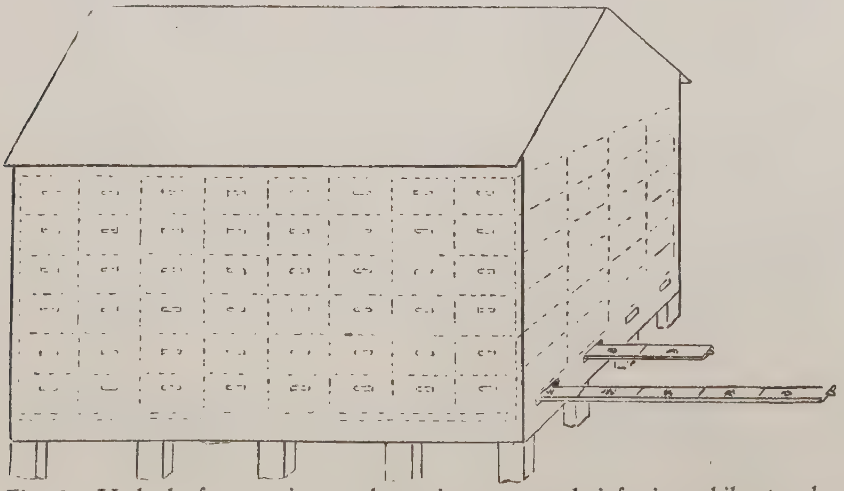

Fig. 3.—Method of preserving combs against wax moth infection while stored in shed.

Conclusion

Beekeepers in districts with mild climatic conditions should take the following necessary precaution against possible wax moth infection:—

1. **Keep strong hives, preferably with Italian bees.**
2. **Refrain from leaving old combs or pieces of wax lying round.**
3. **Make sure the extracting combs receive the proper treatment during the period they are stored in the shed. General tidiness and prevention are the essence of wax moth control.**

—*C. R. PATERSON, Apiary Instructor, Hamilton.*

The Home Orchard

Numerous enquiries from the occupiers of small farm and suburban orchards have led the Department to publish a bulletin explaining the methods available for combating the commoner insect pests and fungus blights. The directions are given in an elementary form to suit the special requirements for the control of codling moth, red mite, woolly aphis, scale insects, black-spot of apples and pears, powdery mildew of apple trees and peach-curl in such orchards. Those interested in the subject are recommended to write to the Department of Agriculture at Auckland, Wellington, Christchurch or Dunedin for a **free** copy of bulletin No. 77.

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POULTRY KEEPING

Winter Egg Production

THE fact that eggs are always in shorter supply during the winter than in spring and summer is not an indication that good egg production cannot be obtained in winter. It is, however, a clear indication that it is more difficult to get satisfactory production at this time. Due to the marked rise in price during the winter months, winter egg production is always attractive economically to any poultry farmer. Although it is against nature to induce birds to lay in winter, modern poultry farming methods have overcome this obstacle to a marked extent. It must be admitted, however, that winter egg production is not a simple problem; rather is it a complex one, dependent upon a number of factors. With the approach of winter, it is an interesting subject for consideration, taking each of the factors involved separately.

(a) The Stock

The stock must receive first consideration, because without the right type of laying bird few of the other factors count for much. Pullets are of the greatest value for winter production, as they come into lay as egg prices rise, thereby giving the fullest return during the high price period. Hens miss this rising market, although if their eggs are not required for hatching purposes, they do give market eggs for at least a part of the winter price period.

Next in importance is the date at which these pullets are hatched. The early-hatched pullets—June-July birds—are in lay in good time to catch the rising egg prices, but even under careful management a percentage of these birds is liable to go into a neck moult and be out of lay during at least part of the best egg price period. Further reference will be made to this point later. Pullets hatched in August and up to mid-September are the birds most easily handled to advantage for maximum winter egg production. Generally, late-hatched pullets are rarely a sound economical proposition, and are certainly not desirable for winter production. Therefore to get the best results, laying pullets should be hatched during the optimum period for hatching, whether light or heavy breed birds.

Winter production will also be influenced by the management or treatment the pullets have received during the rearing season. If eggs are to be obtained when it is least natural for birds to lay the birds must have a reserve of strength, or constitution, to stand up to the strain. They must be healthy and free from internal parasites, such as worms, while their constitutions must be able to resist colds during inclement weather. An outbreak of colds is nearly always disastrous to winter egg production. Mismanagement due to ignorance or slack management during the rearing period is invariably reflected in the egg production obtained during the subsequent winter. Too often producers blame the winter weather for poor production, whereas the condition of their stock after the rearing period is to blame. Well-reared birds, which are inherently good layers, will stand up to average winter weather conditions.

POULTRY FOOD SUPPLIES

WHILE everything possible will be done to maintain an even and equitable distribution of the poultry foods available, particularly pollard and bran, there is little likelihood of extra supplies being received during the rearing season. It is essential, therefore, that poultry producers should build up a reserve of food against the rearing season. In addition, no guarantee can be given that additional supplies will be available to those producers who normally raise perching pullets for sale.

It is interesting to note that winter egg production is considered to be an inherited characteristic in poultry. For this reason it is of considerable value to be able to note or mark birds which lay consistently throughout the winter period. If at the end of their laying season these birds are still in reasonable condition and show no marked faults they make most valuable breeding stock. Obviously, trapnesting provides the best guide in this respect. For similar reasons males bred from winter egg producing females are of value as stud birds. Insufficient attention is paid to these winter egg producing birds, and too little value attached to them as breeding stock. This is not the case among many poultry farmers overseas, where particular attention is paid to winter production when selecting breeding pens.

(b) Housing and Litter

Undoubtedly, good housing is an important factor in winter egg production. While efficient ventilation is essential, housing should afford warm surroundings free of draughts. In countries such as the United States, where extremes of cold are encountered, some producers even go to the trouble of warming their laying sheds. In the United Kingdom laying houses are fitted with windows and controllable ventilation in an attempt to offset sudden weather changes and drops in temperature. It has been found desirable to take these precautions in order to get satisfactory winter egg production. A number of poultry farmers in the South Island use houses which are lower at the front than at the back with the object of affording their birds greater protection during the winter. Some of the farms with this type of housing known to officers of the Department obtain first-class results with the stock during winter.

Laying sheds must also be dry. This point leads to the question of dry litter, one of the important factors affecting laying stock during winter. Admittedly, the district and the site of the house will affect the condition of litter in winter, but quite apart from these two factors much will depend upon whether clean litter is placed in the house during the early autumn and then gradually added to until a really good depth of litter has been built up. In most districts it is almost impossible to maintain dry litter during the winter if fresh litter is placed in the house late in autumn or during the winter

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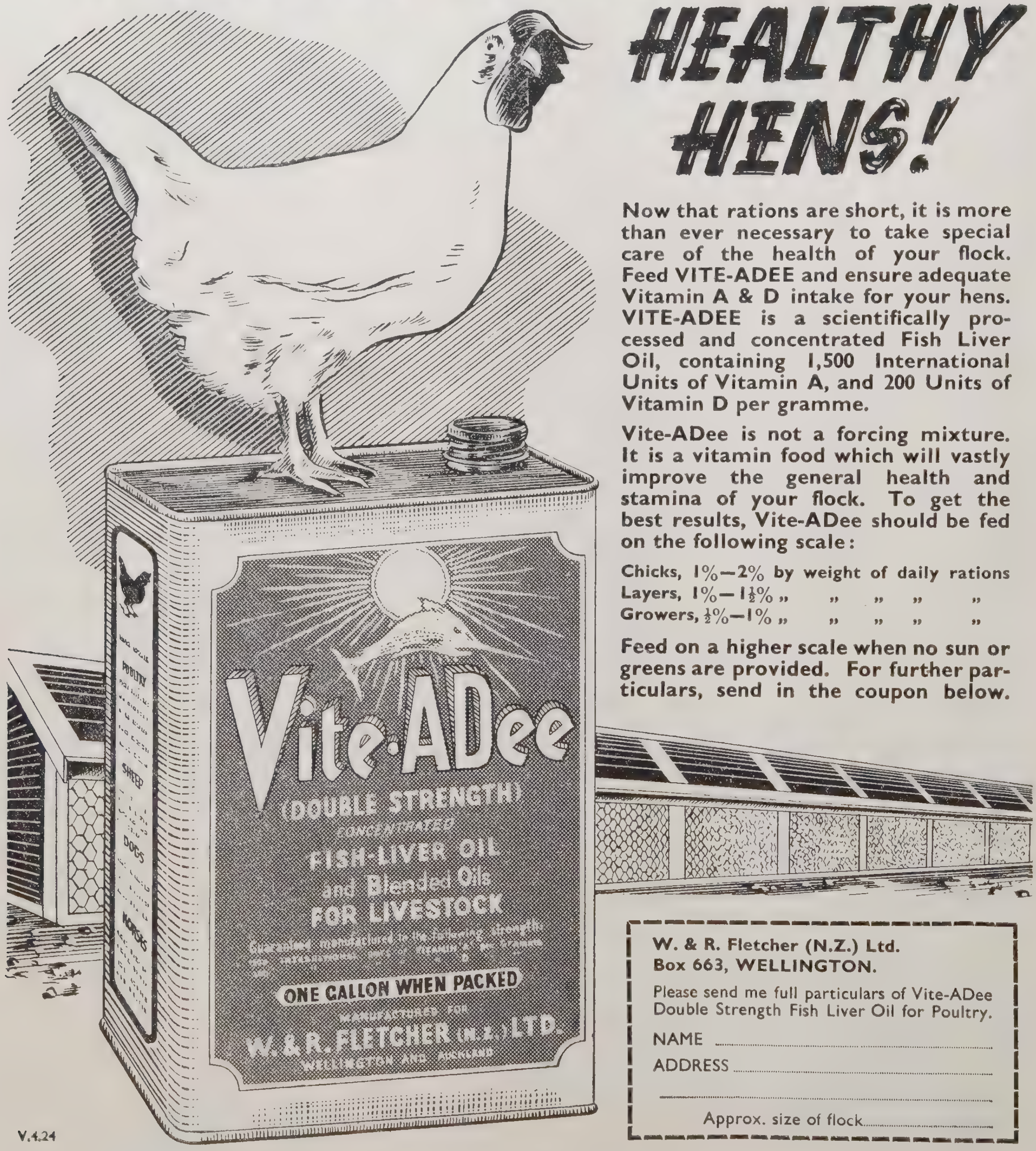
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months. Dry litter in the laying houses is a great asset, and is obtained more by good management and efficient ventilation than by any other method.

(c) Feeding

It is obvious that a properly-balanced laying mash containing an adequate amount of protein (meatmeal) is essential for winter egg production. However, forcing methods by the use of excessive meatmeal are neither necessary nor desirable; they are definitely detrimental to the stock, particularly if such birds are required for breeding purposes in their second laying season. Food consumption, quite apart from the type of feed, is an all-important factor in winter egg production. It is not entirely natural for a bird to eat heavily in winter during the shorter hours of daylight and more unpleasant and uncomfortable weather conditions. There is, however, a direct connection between food consumption and egg production in poultry. Provided the pullets have the qualities of egg production bred in them, it is essential to do all possible to keep up food consumption in winter. For this reason, poultry farmers who normally feed dry mash and grain are recommended to give, in addition, a wet mash in the early afternoon. By that time of day birds will have consumed the greater proportion of the dry mash normally eaten, and the wet mash, which is a palatable method of feeding, will usually induce the birds to eat more than if they are left entirely on dry mash.

Electric lighting during winter has been proved both experimentally and in commercial practice to be an efficient method of increasing winter egg production, and is much employed overseas in normal times. The reason for the success of the artificial lighting of poultry **depends solely upon the fact that the birds so treated consume a greater quantity of food in the twenty-four hours.** In fact, artificial lighting is a failure unless the birds are given extra food. It is not within the scope of this article to describe the correct method of using electric lighting in a laying shed, but full details can be obtained by applying to a Poultry Instructor at any of the main centres, and those contemplating the use of lights are strongly recommended to obtain the correct details of how to use them both effectively and economically.

Reference has been made earlier in this article to "neck moulting." With early-hatched birds a certain number of pullets are always liable to go into a neck moult, particularly if weather conditions are bad, but far too many birds are allowed to go into the moult which, with careful feeding, could be prevented. Early-hatched birds usually come into lay with a good flush of eggs, and unless they are allowed, and in fact induced, to eat sufficient food not only to produce these eggs but at the same time fully to maintain body weight, then a moult will occur. **As soon as any birds in winter lose body-weight, whether from heavy egg production or for any other reason, they are liable to go into a neck moult.**

In this connection the writer strongly suspects that where heavy quantities of green food are mixed in with wet mash during the winter months body weight is lost and moulting occurs. It is logical that if the mash mixture contains an appreciable quantity of green food, then the bird must consume **less mash.** Eggs are then produced at the expense of body weight, the bird drawing heavily upon fat reserves in the body. For this reason, it is strongly recommended that green food be fed separately and if possible towards the end of the day, although it is realised that this method brings labour difficulties with it. A good grain feed at the end of the day will do much to maintain body weight. Maize, when procurable, is particularly valuable for this purpose in winter.

Finally, changes in mash or in the method of feeding during the winter are most detrimental to winter egg production and are often the cause of neck moulting. It is highly probable that producers will meet difficulties of this nature during the present winter owing to the present difficult position in regard to supplies of poultry foods.

(d) Moving of Stock

It is essential to get pullets comfortably settled in their laying houses before they come into production and to avoid moving or unduly disturbing them from that time onwards. Even the sudden introduction of male birds, particularly where first-crossing is practised, may temporarily affect laying pullets. First-cross matings are mentioned because they often mean mixing black or red males with white pullets, or vice versa.

To reap the benefit of high winter prices by obtaining good winter egg production is, therefore, a matter of looking ahead and of studying carefully a number of points, neglect of any one of which may mean failure to obtain really satisfactory results. Good stock, careful management, and constant attention to detail are all required.

—F. C. BOBBY, Superintendent,
of Poultry Husbandry,
Wellington.

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SEEING THINGS THROUGH

Railways' National Responsibility

The tremendous burden the railways have borne since 1939 must continue as long as the war lasts. Transportation's wartime demands can be met only by unceasing effort—effort which the railways have so completely demonstrated they can and will give, conscious that the day is drawing nearer, when they may put aside their war work and with confidence of finer things to come, take up again their peacetime jobs.

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Improvement of Rural Life

Provocative Report by Young Farmers' Club Committee

The following report on "The Development of Moral, Cultural, and Aesthetic Values of Rural Life" has been made by a special committee set up by the Otago-Southland Y.F.C. Council at the request of the Dominion Executive Committee. This report, which is of extreme interest and importance, is published in the hope that it will give rise to comment and criticism from both within and outside of the Y.F.C. organisation. Correspondence on this matter will be welcomed.

AFTER going fairly exhaustively into this subject of many aspects, the committee has been forced to the conclusion that any movement for the betterment of rural life must, to be successful, come largely from the farming community itself. For instance, any extension of country library services must be preceded by an evident desire, expressed through farming organisations, for more facilities because of the local demand for reading matter. The continued patronage of those facilities should remain as an obligation on the rural community.

Much public-spirited work in an endeavour to improve the lot of the country dweller has in the past been carried out by semi-urban organisations, as well as Governments, but many of these schemes have not met with the success they might have deserved, largely because of the average countryman's studied disbelief in the soundness of anything which has not emanated from his own brain or farm. As one of many examples which could be quoted, it will be remembered that the introduction of the rural mail system met with obstinate opposition over a long period, whereas motor cars, the buying of which was a question for the individual and not the community, sold like the proverbial hot cakes.

This individualistic outlook, whatever its disadvantages both to the individual and to the community, must be taken into account until it has largely disappeared through education, experience and the force of economic and social circumstances. Any district community which cannot combine to better those material amenities which have a definite moral, cultural and aesthetic value scarcely deserves to enjoy them. Indeed, it could almost be said that in such cases the residents possessed no inherent capacity nor ambition to enjoy them—that the peasant-like individualistic inlook was more powerful than the enlightened community outlook.

Responsibility for improving the conditions of rural life should rest, therefore, upon the rural communities themselves. In the purely farming districts, as distinct from those in and around townships where a town board or borough council is operating, the spearheads for any community cultural movement should be such bodies as the local branch of the Farmers' Union and Young Farmers' Clubs, and/or the Women's Division of the Farmers' Union and the Women's Institute. Town boards and county councils can give valuable aid over wider communities where their statutory powers permit.

Greater interest in improving the local conditions of human life, as apart from the strictly economic, should be taken by all farmers' organisations for on such improvement depends the happiness of families already established, the checking of the drift to the towns, and the provision of adequate farm staffing for the future.

It is felt that the whole question of improving country life should be tackled from its base, which is that of the individual family in possession of a farm. Farms, and the economic circumstances of families and families themselves, differ so widely that only those points more or less common to all can be treated in this general report.

Aim on Unit Farm

The aim on the unit farm should be to bring about a higher appreciation of farm life by—

(a) making work more interesting by robbing it of worry, drudgery, monotony, and physical and mental weariness,

(b) reducing the hours of work and making any leisure time attractive,

(c) improving the scope for human contacts on and between farms, and

(d), by a combination of the first three objects, leaving the family mind at the end of the working day in a condition fresh enough to desire and appreciate further cultural contacts of a domestic or community nature. If this last-mentioned condition is obtained (and it is fairly obvious that it is often lacking on farms) it will lead to community planning by the people themselves.

The direction which that community planning should take would be a matter for the residents themselves to decide. So many schemes have been propounded that it would serve no purpose to repeat them here. This report concerns itself mainly with suggestions calculated to improve life on the farm and to create a greater demand for such community planning.

To what extent a life of comparative solitude and monotonous work makes for a negative type of mind is a matter for conjecture by psychologists, but an individualistic and negative state of mind is undoubtedly a feature of the older section of the farming community. A psychologist might even claim that the frequent complaints about the drudgery and long hours of farming issuing from Farmers' Union meetings and other gatherings is an inevitable result of solitude and monotony on the farm. However that may be, the most important step in bringing about more happiness on the farm is for farmers to guard against a closed mind and to concentrate on positive and even imaginative thinking.

The state of mind, concerning which a whole volume could be written, is of first importance. It should be above the urgent necessity to get rich quick or the fear of bankruptcy, both of which are negative and tend to cause the farm to own the farmer, instead of vice versa. A philosopher might with some justice claim that it were better to go bankrupt gloriously than become the cringing, fearful servant of that of which the soul of man should be master.

Suggestions

Following are a few self-explanatory suggestions which may tend to make life on the farm, in and out of working time, more endurable for the whole family and the hired man:—

(1) The right approach to farming as an interesting adventure for the observant.

(2) Have the courage to experiment. Dare to be a Daniel, though the lions may rage!

(3) The necessity to strip cows after machine-milking can be obviated without loss of yield if due care is taken.

(4) Where a hired hand is employed, milking on the shift system has possibilities for a less tiring day.

(5) Semaphore signalling can be learned in one interesting evening. Flags are unnecessary. Its use may save tempers and many working hours annually in travel—on small farms for forgotten tools, etc., and on stations during mustering.

(6) Home Guardsmen have used the wires of fences for telephonic communication over many miles. There are possibilities here for peacetime adaptation.

(7) Radio sets and headphones on tractors keep monotony from the mind. In factories radio programmes have been proved to increase output.

(8) A fish-tail silencer on an extension pipe from the tractor makes for better tempers and the keeping of poisonous fumes away from the driver. (A silencer does not decrease the drawing power of a tractor, though it makes for more carbon formation).

(9) Equipping of a tractor with a self-starter is the answer to the prayer of the man who wishes to start the day (and the tractor) in a good temper.

(10) A hood, preferably of the folding type, round the tractor-driver's seat keeps tempers equable in bitter weather, and may considerably increase the number of hours which the tractor-driver works on the machine annually.

(11) Arranging for contractors or machinery pools with modern equipment to carry out such seasonal jobs as baling hay, heading grain, lifting potatoes, and shearing and binning of wool, instead of the individual farmer tackling them by laborious old-time methods lessens labour worries, increases the amount of crop which can be grown, and in cases may cheapen production.

(12) Hard cash is no more important or powerful than the potential cash represented by stock on the farm. Payment of regular wages to working sons and daughters is essential for the development of their personality and independence, and in some cases for their retention on the farm. Other encouragements to youth are personal ownership of such livestock as calves, pigs, or a horse, and membership of a Young Farmers' Club. Purchase of a second-hand typewriter by the farmer may lead to all his correspondence being gladly done for him by the rest of the family (it is considered that farmers lose, or stand to lose, much money and many opportunities through delays in writing).

(13) Much of the physical (and mental) tiredness after a day's work is due to the continual use of one set of physical (and mental) muscles. Expert advice as to methods of counteracting this by such exercises as stretching and the temporary use of other sets of muscles in the evenings is always available.

(14) The happiest farmer is he who allows his sense of humour to become increasingly developed and who perhaps accomplishes more by not taking his work too seriously and mixing it as far as possible with pleasure. For instance, he or his family or hired man may not aspire to golf championship status, but they will derive much physical relaxation and mental concentration through an old golf club and a ball while going round the sheep or out to the day's work on the tractor. It is quite as interesting as carrying a gun in rabbit country, and even if by the end of the year half the livestock have lost one eye the farmer may still feel that he and his hired man have had a great golfing season!

(15) Well laid-out surroundings of a home, along with a vegetable garden, pay big dividends in contentment and health, and may constitute a major argument in the price at which the property may be sold, especially in cases where a woman's voice carries weight with her purchasing husband.

Welcome Bay Club's Field Day

By A. G. TALBOT, Hon. Secretary, Welcome Bay Y.F.C.

A PLEASANT and instructive field day was recently staged by the Welcome Bay Young Farmers' Club on Mr. K. Bennett's farm at Papamoa, there being a very good attendance. During the morning the party inspected a very even line of yearling Jersey bulls, several sires of the herd, and a good line of heifers. Following this, an enjoyable half-hour was spent on the verandah of the homestead, where lunch was served by Mrs. Bennett and several friends.

In the afternoon the visitors inspected Mr. Bennett's fine herd of 70 Jersey cows. Later, four cows from the herd were tethered to a fence, and the club members were given the opportunity to judge them. The judging was carried out in two classes, junior and senior, a small prize to be awarded to the winners of each class. After 40 minutes all cards were handed in and Mr. Bennett judged the cows and placed them, pointing out the good points and faults. Mr. Bennett has since judged the cards, and the results are as follows:—Juniors: R. Evans, 1; L. Aitken, 2; G. Phillips, 3. Seniors: A. B. Mossop, 1; J. R. Wright, 2; A. G. Talbot, 3.

After the judging competition was concluded a line of very fine calves was inspected, the evenness of the stock being again demonstrated by these animals. Of further interest was a demonstration with a post-hole auger given by Mr. J. C. Hammond. During afternoon tea a vote of thanks was moved by the club chairman, J. R. Wright, to the ladies who had so willingly supplied lunch and afternoon tea, and a vote of thanks to Mr. Bennett for the very capable manner in which the field day had been conducted and also for the use of his farm and stock. Mr. Bennett suitably replied, and expressed the hope that a further field day would be conducted on his property next season.

Whirinaki Y.F.C.

By GEO. WYNYARD, Hon. Secretary, Whirinaki Y.F.C.

THE Whirinaki Club was formed about a year ago among the Maori youths in the Hokianga district, North Auckland, and has had a most successful year.

The Whirinaki Y.F.C. tree nursery, sown last October, is coming away splendidly, and the trees should be ready to transplant during the coming winter. The club, combined with the Women's Institute, held a fruit, flower and vegetable show on February 27. This show was a great success, there being quite a number of exhibits entered by both pakeha and Maori competitors. A merry-go-round was engaged for the benefit of the children. The club catered for the crowd by providing a tea-room, a "hangi" and an ice cream stall, and everyone thoroughly enjoyed the day. From a financial point of view the show was also a great success, netting a profit of £33 16s. 6d., to be divided between the Whirinaki Women's Institute and the Young Farmers' Club.

A fishing trip on the Hokianga Harbour has been arranged, and all members are looking forward to a good day's sport with the well-known Hokianga schnapper. The annual meeting of the club will be held shortly, when a review of the year's activities will be discussed.

Gestation Table

Mares ..	340	days	from	date	of	service
Cows ..	283	”	”	”	”	”
Ewes ..	150	”	”	”	”	”
Sows ..	116	”	”	”	”	”
Bitches .	63	”	”	”	”	”
Rabbits	28-30	”	”	”	”	”

Wanganui Inter-club Sports Meeting

By MALCOLM F. GRAY, Hon. Secretary, Marton Y.F.C.

THE first inter-club sports meeting in the Wanganui district was held at Rata Sports recently. Unfortunately, only two clubs participated, Hunterville and Marton, and consequently the competition lacked some of the interest it might otherwise have had. Nevertheless, some very keen races were run and though Marton had an easy win, Hunterville were by no means downhearted. On the contrary, they have challenged Marton to a football match and have good prospects of a win.

It is hoped that in future this sports meeting will be an annual fixture, especially as Mr. E. Pickford, Rata, has generously donated a challenge cup, which, it has been suggested, should be a memorial to young farmers from the Wanganui district who have lost their lives in the war. The sponsors of the sports meeting are greatly indebted to Mr. A. H. Rhodes for the use of his property and also to the Rata Sports Committee for their co-operation. Thanks are also due to those who supplied equipment and acted as officials. A donation by Mr. W. H. Coles, Marton, of specially printed cards to be issued to the winners of the various events is also gratefully acknowledged.

All the events, with the exception of the high jump, took place in a paddock adjacent to that where the main sports were held. The grass was rather long, which made the track slow. The day was fine, but with a strong and at times chilly wind blowing straight across the field. For these and other reasons, no records were broken. However, the meeting proved most enjoyable and augured well for future occasions. Members of the two clubs are thanked for coming early to mark out the course.

The officials were:—Starter, Mr. H. A. Moss; timekeeper, Mr. W. H. Coles; judges (track events), Messrs. H. G. Stewart and J. Bartlett; (jumps), Messrs. W. H. Coles, H. G. Stewart, G. R. Gower, J. Bartlett, and M. Henwood.

The following events were run:—Track, 100yds., 220yds., 880yds., and 1 mile; field events, long jump, high jump, and hop, step and jump. In future it is intended to start earlier and include putting the shot, a tug-o-war and a mile relay race consisting of a 440, two 220's and an 880. It has also been suggested that no member may enter for more than two track events, but may enter any number of field events. Clubs will also be limited to the number of competitors they may enter for each event, but this will largely depend upon how many are present.

The following are the results, (M) signifying Marton and (H) Hunterville:—

100yds.—V. Stantiall (M), 1; M. Whale (M), 2; T. Goldsmith (M), 3. Time, 11 sec.

880yds.—K. Coles (M), 1; M. Gray (M), 2; J. Taylor (H), 3. Time, 2 min. 27 sec.

220yds.—V. Stantiall (M), 1; M. Whale (M), 2; T. Goldsmith (M), 3. Time, 24 sec.

One mile.—K. Coles (M), 1; H. England (H), 2; A. Dickey (M), 3. Time, 5 min. 57 sec.

Long jump.—M. Whale (M), 1; V. Stantiall (M), 2; A. Bostock (M), 3. Distance, 17ft. 1in.

Hop, step, and jump.—V. Stantiall (M), 1; K. Coles (M), 2; T. Goldsmith (M), 3. Distance, 39ft. 4in.

High jump.—H. England (H), 1; V. Stantiall (M), 2; K. Coles (M), 3. Height, 5ft. 2in.

Marton won the competition with a total of 54 points.

Reports on Club Activities

WESTERN SOUTHLAND

Orepuki.—Annual meeting. Officers elected: Advisory president, Mr. H. J. Townshend; chairman, D. McPherson; secretary and treasurer, J. D. Young. Twenty-seven members present at the meeting.

MID-CANTERBURY

Ashburton.—Discussion on visit to Canterbury Frozen Meat Co.'s works. Short talks by members, as follows: L. Langdon ("Making of Concrete Posts") and F. Greenslade ("Irrigation"). An instructive lecture on "Irrigation" was given by Mr. G. G. Calder, Department of Agriculture. The full club membership of 22 present.

Methven.—Annual meeting. Officers elected: Advisory president, Mr. R. J. Low; chairman, G. Limbrick; vice-chairman, W. Hart; secretary, S. Callaghan; assistant secretary, A. Grigg; treasurer, S. Mangin. One new member elected. S. McKay, delegate to the local Farmers' Union, gave a report on a recent meeting of that body; W. Hart reported on the last A. and P. Association meeting in connection with the stock-judging competition to be held at the Methven Show. Attendance of 25 members.

NORTH CANTERBURY

Scargill-Omihi.—Annual meeting. Officers elected: Advisory president, Mr. J. Sloss; advisory members, Messrs. W. H. Brown and A. E. Hunt; chairman, H. N. Munro; secretary and treasurer, H. F. Symonds. Sixteen members present out of 29.

MARLBOROUGH

Flaxbourne.—Annual meeting. Officers elected: Advisory president, Mr. W. S. Morrin; chairman, J. J. Forsyth; secretary and treasurer, E. F. Rudd. Fourteen members present.

WAIRARAPA

Alfredton.—Annual meeting. Officers elected: Advisory president, Mr. A. A. Napier; chairman, A. Heckler; secretary and treasurer, R. W. Seymour.

Carterton.—Annual meeting. Officers elected: Advisory president, Mr. E. T. Bliss; advisory members, Messrs. H. McKenzie and W. B. Campin; chairman, J. Rose; secretary, F. Playle; treasurer, D. Basset. Teams selected for club debate at next meeting, (a) D. Basset, F. Playle, and T. Fell; (b) B. Card, R. Riley, and J. Jones. Two new members enrolled. Decided to donate 10/- to the A. and P. Society. Seventeen members in attendance.

MANAWATU

Apiti.—Annual meeting. Officers elected: Advisory president, Mr. H. C. McIntyre; chairman, P. R. McKay; secretary and treasurer, R. L. Nicholson. Nineteen members present.

Bunnythorpe.—Annual meeting. Officers elected: Advisory president, Mr. J. Linklater; advisory members, Messrs. A. F. McKenzie, A. J. Galpin, H. J. E. Gunn, H. Robson, and R. Stewart; chairman, Trevor Hyde; vice-chairman, S. C. Anderson; secretary, Macgregor Donald; assistant secretary, John O'Brien; club reporter, R. E. Clevely. Five new members enrolled. Decided to place an order with the Wellington Council for a Roll of Honour plaque. Discussion on the subject matter for a proposed radio talk by club members from 2ZA, Palmerston North. Mr. S. G. Avery, chairman of the Wellington Council, and vice-president of the federation, was present, and gave an address on the "Activities of the Y.F.C. Movement in New Zealand." There was an attendance of 18 members.

Kairanga.—This club has recently resumed activities, after having been in recess for over three years. Twenty-four members were enrolled at the "revival" meeting, and officers were elected as follows: Advisory president, Mr. N. P. Neilsen; chairman, N. Wilson; secretary, B. Neill; treasurer, T. Zurcher. This club was one of the most active in the Manawatu before the war, and we are pleased to welcome it back to the fold. With any luck at all its membership should be doubled before the year is over.

Oroua Downs.—Annual meeting. Officers elected: Advisory president, Mr. R. Craig; chairman, R. Shailer; secretary and treasurer, W. Christensen. Lecture by Mr. Johnson, Department of Agriculture, on "Beekeeping." Eighteen members present out of 21. At the following meeting arrangements were finalised for a club dance, and a lecture on "Poultry-keeping" was given by Mr. F. W. Marchant. Five new members enrolled; 25 present out of 26.

Rongotea.—Annual meeting. Officers elected: Advisory president, Mr. R. O. Gloyn; chairman, R. W. T. Hill; secretary and treasurer, C. A. Hall. A series of interesting movie films on Jersey cattle, and also travel scenes, were exhibited by Mr. G. Dawick, secretary of the N.Z. Jersey Cattle Breeders' Association. There was a full muster of 32 members.

WANGANUI

Mangaweka.—Annual meeting. Officers elected: Advisory president, Mr. C. W. Dickson; chairman, N. D. Weston; secretary and treasurer, J. R. Dalrymple. There were 10 members present.

SOUTHERN HAWKE'S BAY

Dannevirke.—Annual meeting. Officers elected: Advisory president, Mr. L. Feierabend; chairman, J. Hartridge; secretary, J. L. Sunderland; treasurer, G. Redward. Sixteen members present.

Mangatainoka.—Annual meeting. Officers elected: Advisory president, Mr. W. D. Harris; chairman, M. Osborne; secretary and treasurer, G. V. Brown. Fourteen members present.

TE KUITI

Otorohanga.—Annual meeting. Officers elected: Advisory president, Mr. Noel Tipping; chairman, G. L. Clark; secretary, C. H. Sanders; treasurer, W. Staite. There was an attendance of 22 members out of 26. At the previous meeting Mr. W. W. Nelson (a local apiarist) delivered a most interesting and instructive address, explaining and illustrating the life and work of the honey bee; he also gave a brief survey of his modern plant, and his experiences as a beekeeper over a number of years, and explained the past and present methods of marketing honey. There were 12 members present at this meeting.

Te Anga Central.—Field day held on Mr. S. Vicary's property, Maroea Road. Demonstrations were given by Mr. W. Johnstone, of Puketutu, on Romney sheep and Polled Angus cattle. There was a total of 53 present, including 18 visiting club members and 15 farmer friends.

BAY OF PLENTY

Kati Kati.—Annual meeting. Officers elected: Advisory president, Mr. H. Capamagian; chairman, N. Leach; secretary, W. Hume; treasurer, W. Nettlingham. Fourteen members present at the meeting.

Omokoroa.—Annual meeting. Officers elected: Advisory president, Mr. H. A. Gardener; chairman, O. Steward; secretary, H. E. Boyes; treasurer, M. Boyes. Attendance of 16.

Paengaroa.—Report on recent athletic meeting; profit of approximately £12, this money to go to the club's quota for the Y.F.C. Memorial Fund. Final arrangements made for the calf-rearing competition. Impromptu speeches by club members as follows:—J. B. Cawte ("Haggis"); M. Cawte ("The Eel Industry"); W. Conway ("Ploughing"); L. W. Rowe ("Reminiscences of Dances"); R. Vant ("Pampas Grass"); H. Walker ("Farming in Otorohanga"). Twenty-two members present.

Pukehina.—General business; discussion regarding means of transport to Tauranga athletic meeting. Short address by Mr. G. Spratt on the Y.F.C. Memorial Fund. Mr. Spratt explained how the quotas had been allocated; he also spoke on Y.F.C. activities in general. Officers were elected at the annual meeting as follows: Advisory president, Mr. S. Winters; chairman, B. Gordon; secretary, J. F. Reid; treasurer, R. Fulton. Nine members present out of a total of 22.

Tauranga.—Arrangements made for two dances, and also for a fishing trip. Address by Mr. A. V. Allo, Department of Agriculture, on the "Growing of Pampas Grass." Nineteen members present out of 25.

Te Puna.—Annual meeting. Officers elected: Advisory president, Mr. Lloyd; chairman, R. Williams; secretary, J. Elwin; treasurer, D. Lockhead. Attendance of 12 members.

Waimana.—Lecture by Mr. Alex. Thompson, veterinarian, on "The Veterinary Side of Farming." Fourteen members present out of 28.

Welcome Bay.—Dance balance-sheet presented, showing a substantial profit. Five new members enrolled. Arrangements made for a fishing trip. Report on recent field day, which was a marked success. Address by Mr. A. V. Allo, district Y.F.C. secretary; Mr. Allo congratulated the club on its progress during the comparatively short time it had been functioning. He also brought forward many points of interest to the club, and gave some very sound advice. Officers elected at the annual meeting: Advisory president, Mr. J. C. Hammond; chairman, J. R. Wright; vice-chairman, H. Bartz; secretary, A. G. Talbot; treasurer, L. Aitken. Twenty-two members present out of 27.

WAIKATO

Cambridge.—Letter received from an overseas member, N. Graney; also communication from the Waikato A. and P. Association asking the club to appoint delegates to the show committee. Report of the Waikato Y.F.C. District Committee received and discussed. The advisory president, Mr. G. A. Walsh, outlined the Farmers' Union plan to hold a farming course at Hamilton; the meeting decided to support the proposals. Officers elected at the annual meeting: Advisory president, Mr. G. A. Walsh; chairman, G. C. Herbert; secretary, R. L. Chynoweth; treasurer, C. C. Chynoweth. Attendance of 17 members out of 55.

Okoroire.—Annual meeting. Officers elected: Advisory president, Mr. W. B. Hardwick; chairman, F. D. Rose; secretary, F. A. Verry; treasurer, J. R. Porter. Twenty-five members present.

Te Awamutu.—Annual meeting. Officers elected: Advisory president, Mr. A. S. Wyllie; chairman, C. W. Eyre; secretary, F. E. Turner; treasurer, A. E. Smart. There were 35 members present. A field day was held on Mr. Brownlee's farm, Frontier Road. Mr. Brownlee showed members the methods of breaking in a young horse; he also gave demonstrations of the special attachment for using three horses in a mower, and the setting of a plough for various classes of country. The attendance totalled 37, which included 21 visitors.

AUCKLAND

Clevedon.—Annual meeting. Officers elected: Advisory president, Mr. A. D. Bell; chairman, A. Blundell; secretary, B. Ryburn; treasurer, D. F. Ryburn. Thirteen members present.

East Tamaki.—Annual meeting. Officers elected: Advisory president, Mr. H. Ferguson; chairman, L. W. Gubb; secretary, G. W. Guy; treasurer, A. Shaw. Twenty-eight members present out of 44. At a previous meeting a tug-o'-war team was selected to take part in the East Tamaki patriotic sports; Dr. W. S. Hill addressed the club, and gave suggestions for Y.F.C. work generally. A field day was held at the N.Z. Co-op. Dairy Co. at Epsom, the main feature being an interesting lecture with illustrations by Miss Cunnold, B.Sc., on various tests for town milk; including the reductase test and the plate count. There was an attendance of 20 club members and 11 pupils from the Howick District High School.

Franklin.—Annual meeting. Officers elected: Advisory president, Mr. R. W. Franke; chairman, R. W. Legg; secretary and treasurer, C. C. Upton. Notice of motion had been given that the club headquarters be changed from Drury to Rama Rama; an amendment was prepared that the club split up into two clubs, one at Drury and one at Rama Rama. Members considered that although it would ultimately be in the best interests of the Y.F.C. movement to form two clubs, the time was not opportune in view of the present comparatively small membership. The amendment was defeated and the motion carried. A further motion was carried that the matter of dividing the club be brought up at the next annual meeting. A report on the last meeting of the District Committee was discussed. Mr. A. D. Mercer, Department of Agriculture, who had recently taken over the district secretaryship, gave an interesting address on "General Farming Topics," and answered numerous questions. There was an attendance of 20 members.

Harrisville.—This club has recently resumed activities after being in recess for about three years.

Pukekawa.—Annual meeting. Officers elected: Advisory president, Mr. J. L. Cathcart; chairman, L. Hunter; secretary, C. T. Brewster; treasurer, D. R. Orr. Seventeen members present.

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THE GOOD NEIGHBOUR

OUR MOTHERS

IT has long been customary to dedicate one Sunday in the year to the honouring of motherhood. Everyone wears a white flower buttonhole, special services are held in the churches, and the attention of young people, particularly, is directed to the unceasing, devoted service that is the hallmark of mothers the world over. Gift-giving in conjunction with Mother's Day is becoming increasingly publicised through sales campaigns, but despite the rather commercial aspect of such advertising, it is undoubtedly a good thing that we should express in a tangible form our appreciation of the love and care lavished upon us by our mothers.

The amount of work which the average mother of a family achieves in the course of a day is something at which to marvel—she is housemaid, laundress, cook, gardener, seamstress, and children's nurse all rolled into one.

"A woman's day? Oh, yes, it's full.
Washing dishes, making beds,
Smoothing pillows for tired heads;
Every room to keep just right,
Sweet with flowers and firelight bright.
In the kitchen for a while
There, to study, to beguile
Nature's gifts from bounteous earth
Into food of highest worth;
Fashioned into dainty meals
Which nourishment and skill reveals.
And somewhere found are garments old,
Which many stitches could unfold,
But still they're patched, and stitched again,
Till mostly patches there remain,
And socks are darned in self-same way,
With stitches neat in crossed array.
And unexpected duties, they
Flit in upon a woman's day.
But on each task a lovesome mind,
A shining there will leave behind,
And at day's end . . . a woman's lived her Daily Psalm."

And yet all these tasks, numerous though they be, comprise only one part of a mother's activities; they are merely the outward evidence of her housekeeping ability. (Incidentally, it is to be hoped that after the war scientists will turn their energies to the perfecting of labour-saving devices for domestic use, whereby much of the drudgery of housewifery may be lightened).

As a homemaker, she is responsible for an even more vital and complex undertaking—that of understanding the members of her household. She must be ever prepared to make adjustments, to lay aside her own interests in order to fulfil the needs of those who depend on her for sympathy and guidance; and such is the unpredictability of human nature that problems have a habit of cropping up at the most unexpected and inopportune times. She must be ready to advise and encourage, without encroaching upon the individuality of her children; she must not hesitate to train and discipline them, yet she must not use her authority harshly lest she lose their trust and affection; she must teach them by her own example, rather than by precept, the fundamentals of right living—honesty, unselfishness, courage, and co-operation.

One of England's most eminent woman M.P.'s said recently:—"Happy marriage and sound healthy home life are the foundations of a sound, stable, constructive, national existence. The importance of a happy home life cannot be over-emphasised. . . Because home life is a real and living thing, it cannot remain static and conditions under which it is maintained must of necessity change with custom and with time. Our duty is to endeavour to ensure that new custom and new outlook preserve and enhance the spiritual reality in spite of the material change."

The home is still the "basic social unit of all societies," and the mother is the heart of the home. She it is who sets the standards of the child's conduct, his sense of values, his attitude to life—the things on which so much of his future depends.

Hands articulate and wise
And full of courage . . . Hands of mothers,
Strong beyond reckoning, tender past surmise,
These are more loved, more lovely than all others.

Where the upbringing of children is concerned God has placed the supreme task — the building of character — in the hands of mothers.

Mary

PEACE TALK

Through the chaos of war shines a hopeful future . . . a future of new promise and opportunity for young lives of to-morrow. And in the midst of war it is sometimes good to let our minds dwell on thoughts of peace . . . of the good things in life we are fighting for.

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Radio and the Child

By BRYAN O'BRIEN.

RADIO is probably the most potent tool in the world today as a supplementary force to education. The microphone is a weapon of such power for good or evil that it becomes apparent at once what a great responsibility lies on those whose job it is to guide the young idea. Hitler rose to power on the microphone, poisoned the young minds of a whole generation, and plunged the world into war.

IT has been estimated that the average child listens for approximately 2½ hours per day, this figure including school broadcasts. Unfortunately, radio programmes cannot be designed solely for the child. The responsibility therefore lies not only with the broadcasting authorities, but also with the parents. There is a primary responsibility on the parents to supervise the child's listening as they would his reading. It can be said, I think, without fear of contradiction, that this duty is not being properly discharged by the parents. Sometimes it is a failure to realise that the duty exists; sometimes it is just weakness in allowing the child his own way.

It is, however, so easy to jump to sudden and misleading conclusions as to what is or what is not harmful to the child. "Sensationalism" and "melodrama" are overworked words in the litany of children's session criticisms. The average boy demands this emotional outlet. His most popular toy is a gun, wherewith he proceeds at once to fight imaginary battles, and stalks man-eating tigers through the jungle. Place a group of small boys together. It won't be long before they are playing "bandits" or "pirates" in which the loss of life is simply terrible to behold—many of the corpses springing to life to be despatched again and again. Children have really no conception of death and suffering unless it is presented in a very objective way.

Bryan O'Brien

The effect of some of these sensational adventure programmes on the mind of the normal and well-balanced child is quite impermanent, and such programmes insofar as they do not offend morality or good taste should not be condemned merely because some few over-sensitive children are adversely affected thereby. Here again the responsibility lies with the parent and he or she cannot escape it. It is hardly an excuse to say that the child cannot be prevented from listening. If certain articles of diet are forbidden the child, then surely certain radio programmes that are unsuitable can be proscribed.

Actually, the listener (and the term includes the parent) has a much greater influence on the form and subject matter of programmes than he imagines. Worthwhile criticism is welcomed and notice is taken of it. It is all to the good of broadcasting that this sense of community responsibility be fostered and encouraged. Broadcasting is too important a thing to be entirely outside the directive force of constructive public opinion.

In regard to the listening end of it, the responsibility to hear good entertainment programmes rests mainly in the home as a matter of selectivity. Two and a half hours a day is probably too long a time in proportion to the other recreational activities of the child to be devoted to radio. Busoni, speaking of music, used to say (and that was in the days before radio and the gramophone) that there was too much of it. With him it was a sort of rite that should be approached with reverence and respect. And I think it was Shakespeare who urged us not to "dim the fine point of seldom pleasure." Radio, whether for the child or adult, should be listened to with discretion and discrimination. Too often it defeats its own end by being merely a continuous background to the day's activities.

Trends in Children's Programmes.

What are the trends in relation to children's programmes? There is definitely a trend in the direction of better programmes for the children. It has been proved that, given the opportunity, the child will just as readily listen to travel, biography, history, and popular science as he will to the "blood and thunder" serials, if the aforementioned are attractively presented. He can be made to listen to good music if the ground is properly prepared for him. The child is being encouraged to think for himself and to express his own ideas. Some startling flashes of wisdom or intuition have at times

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been heard from very young children on the air when the programmes known as "forums" were regular features of the children's sessions before the security regulations necessitated their suspension.

In regard to the influence of broadcasting on speech criticism of slang, bad grammar, and poor diction may properly be directed against announcers or speakers, but they are pointless when directed against a performer speaking in character. Here again the only standard is good taste. The impeccable diction of the "goody" is shown to greater advantage against the poor diction of the "baddy," and the moral is obvious.

Dare one say that the speech of the average New Zealand child is poor? Speech is, as it were, the shop window of a nation, and as such its importance cannot be over-stressed. Here is a wide open field for both schools and radio. Let us hope they will both take the fullest advantage of it.

◆

"Storytime with Bryan O'Brien"

ONE of the highlights of Sunday evening broadcasts is the half-hour session known as "Storytime with Bryan O'Brien." This all-too-brief session has been featured nationally for over eight years, and its popularity is such that it is enjoyed by an ever-increasing number of grown-ups as well as the juvenile listeners for whom it is intended. It is singularly appropriate, therefore, that Bryan O'Brien's newly published volume of stories should bear the title of the session which he originated and still personally conducts. In addition to his radio activities he is also a composer and his song, "Shoes," the first of the cycle, "Songs of Mischief," recently made its appearance in the music-shops.

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Where story-writing is concerned Bryan O'Brien's preference inclines towards realism rather than fantasy, although he is quite at home in the world of faery, as witness his serial play for children, "The Enchanted Forest." Moreover, he portrays the factual so that it appeals to the imagination, and geography and natural history thus take on a new interest.

Although this book was not written for children in the primers, yet five and six-year-olds can enjoy the rhythmical quality of the prose and the general outline of the plot. The gay cover and illustrations are the work of McNamara, a Wellington artist whose cartoons have earned him distinction.

As a member of the second Antarctic Expedition led by Admiral Byrd, Bryan O'Brien has experienced at first-hand the treacherous blizzards and relentless snows he describes so convincingly in his opening story, "Lars and the Reindeer." The young Lapp boy rescued an injured fawn, and to save it from death he courageously decided to hide it in the trolls' cave which nobody had ever dared to enter. As he neared the dark cave "Lars noticed all the little familiar things: a round stone that looked as if it had been polished by human hands, a gnarled stump of birch that somehow contrived to send out shoots. The shrill laugh of a ptarmigan broke the stillness. It came from a hollow in which he had once found the nest of a snowy owl. Determinedly, with set jaws, he marched on to the mouth of the cave. The setting sun was transforming the moor into a realm of shadows. Mossy boulders assumed sinister shapes. Surely the dreaded trolls could not be far away."

But the trolls seemingly approved his kindly action, for the fawn grew strong and well, and ultimately rejoined his companions in the wilds. "The wheel of the seasons turned round once more. Winter sang her wailing song through the naked birch trees. Spring came, wakening the barren heathland and quickening every growing thing into verdant life. Summer like a dream of beauty flowed across the moors, gathering in her robes of gold as she passed by. Autumn, the enchantress, took the scene, painting heath and woodland in colours of mellow loveliness." Then came the worst winter "in living memory," and the Lapps had to kill their precious herds for food, yet still the snows held. The rumour that a lone reindeer had been observed near the plateau caused Lars to investigate and he found it was indeed the animal he had befriended. He was faced with the alternative of shooting his friend or dying of starvation. How the tragedy was averted and the reindeer fought and vanquished the wolves which attacked Lars and his father, makes exciting reading.

Though not attempting to moralise in any way, the tale of the elephant and the kitten teaches a valuable lesson in kindness to animals, and the same may he said of the life-story of the Arab thoroughbred, Haleb. In this, his longest work, the author has created a particularly vivid character in the lad, Ali, and the epic of his ride across the desert, followed later by the stallion's race against the most famous horse in Damascus, comprises dramatic writing at its best. It is to be hoped that Bryan O'Brien will continue to record many more stories in book form as well as "over the air."

Children of Tomorrow

Little voices calling,
From the Land of Dreams,
Little hands caressing
In the sun's warm beams;
Little peals of laughter
From the woodland streams,
Children of to-morrow coming near.

Dancing on the wavelets
From the Land of Yore,
Calling to companions
Who have gone before;
Asking of the Nightwind,
Will their day be soon
When their turn will come to reach
the land.

Rest thee, children, safely
In the Land of Dreams,
Till the Star god Woden
Tires of all his schemes;
Till the Dawn of Peace comes
In the eastern sky
And the men of Earth can greet
thee well.

—**E. I. Ashforth.**

◆

So act that your principle of action would bear to be made a law for the whole world.—Kant.

What I Wish Most For My Child

THE universal wish of mothers for their children is for the blessing of good health and the development of those spiritual qualities, such as faith, courage, honesty, and compassion, which are so essential to the building of character. Few mentioned any specific calling they desired their children to follow, the majority expressing the hope that the choice of a career would be determined by the child's own inclination and ability.

The first prize was won by "Rahiri," Waikato; "Bry," Eltham, "Joyce," Invercargill, and "Ngakaunui," Feilding, tied for second place. Highly commended:—"Homespun," Halcombe, "Tiggetty Boo," Katikati, and "Ruth," Gisborne.

First Prize

THREE wishes! First, I wish my child to be a good Christian and all that it embodies—to be tolerant, faithful, just, truthful, loving, and kind. Second, I wish my child to be truly intelligent, not merely a child with brains but one with a balance of humour, philosophy, and common sense. Third, I wish my child to be healthy and clean, both in mind and body, so that in work and play he can cope with the trials and joys that life holds in store for him.—**"Rahiri," Waikato.**

Second Prize (Equal)

I HAVE entertained many heartfelt wishes concerning my child's happiness, but these are the three I consider the most important.

First, I wish that he will have a real friend—someone who will share, yet enlarge, his world, who will teach him that the golden meaning of that lovely word, friendship, is forbearance, understanding, and love.

A sensitive appreciation of the beautiful is my second wish. If he has this, he will be eternally delighted, soothed at all times, and remain humbly grateful for all our good gifts.

The words of an old Chester prayer provide me with my third wish—

"Give him a sense of humour, Lord;
Give him the grace to see a joke;
So get some happiness from life,
And pass it on to other folk."

These wishes, if fulfilled, will ensure that my child will enjoy a satisfying joyous life in the changing post-war years.—**"Bry," Eltham.**

Second Prize (Equal)

MY wishes are simple, yet stupendous; simple in that they embrace no apparent worldly success, but stupendous in the happiness they will bring. The first is faith—a beautiful, trusting faith in God and man. The striking simplicity of childhood is founded on this one ideal, and yet the possession of such a gift is the envy of the world today. Next, I would ask for health to enjoy the beauties of the world, to stand up to its many hardships and to reap the satisfaction of work well done. Last, but not least, would be a strong capacity for loving and being loved in return.

LOVE

Love, secure in equal love, alone upon the earth
Exceeds all seasons. Though it bud and bloom
And send up children's petals of sweet mirth,
The parent plant will flourish, and the room
Which houses it grow brighter . . . .
What else in all the earth can day by day
Grow richer on the thing it gives away?

Love is the gift which paints a dull, drab world with a spiritual tenderness, as a blazing fire dispels the gloom of a winter's night.—**"Joyce," Invercargill.**

Second Prize (Equal)

WHAT a stimulating subject for the imagination and what a fine opportunity to exercise wishful thinking to the full. Here are my three wishes:—

1. Good health, in order that my child may build his life on the foundation of a sound body. I would have him enjoy the carefree pleasures of childhood with spontaneous vigour, and have energy to meet the strain and stress of later life.

2. Wisdom—something more than good intellect. I would have him possess the will to use all his talents for the greatest good.

3. Understanding. I wish him those spiritual qualities of kindness, tolerance, and sympathy towards his fellows that he may enjoy a truly abundant life.—**"Ngakaunui," Feilding.**

Highly Commended

COURAGE to face the adversities of life, sympathy for the sorrowing heart, faith that good will triumph: these are the gifts I would choose to give my child.

Hugh Walpole makes one of the characters in "Fortitude" say, "It's not life that matters, it's the courage you bring to it," and this is true. Those who have the gift of courage can bear any trials which may be thrust upon them, whilst the fearful sink under the burden.

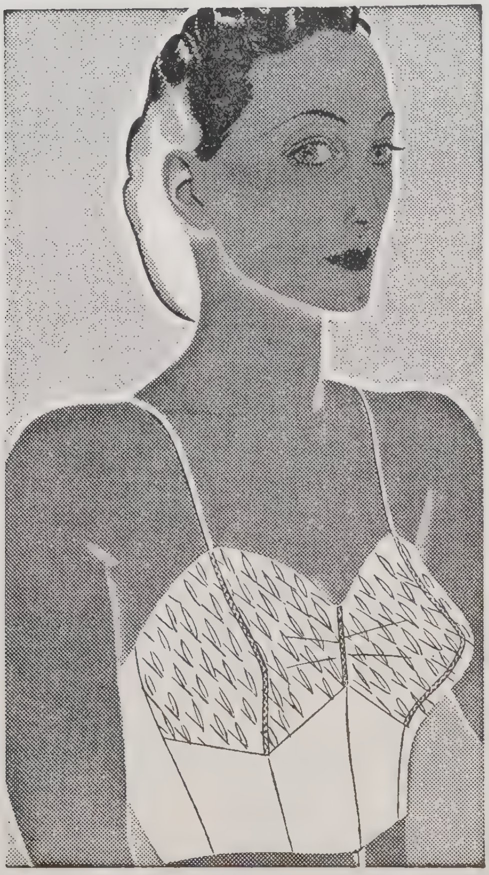
I would have my son sympathise with those in trouble, and give a silent handclasp where words are inadequate; to recognise the need of those in want and try to alleviate it; to look for the good hidden in everyone.

Finally, he would have faith in God and that men are made in His image. In this belief he would strive to make this world a better, saner place. He would be—

"One who never turned his back, but marched breast forward,
Never doubted clouds would break;
Never dreamed, though right were worsted, wrong would triumph."

With these gifts I should not need to feel anxious for my son when he stepped out alone into the world. He

"Faithfully yours . ."



"Faithfully yours . . ." because Berlei's new multiple fitting brassieres allow for the way you are built as well as the inches you measure—fit your shape as well as your size.

Look at the little figures below...see how our bust-shapes vary. Seven women may measure the same, yet have entirely different developments. Isn't it absurd, then, to buy your brassiere merely by bust size? The inch-tape measurement ensures a fit for your 'circumference'; but it's hit or miss whether the little pockets correspond with your own particular curves. If they don't uplift too much, support too little, flatten where they should encourage, or spread where they should shape, it's sheer luck!

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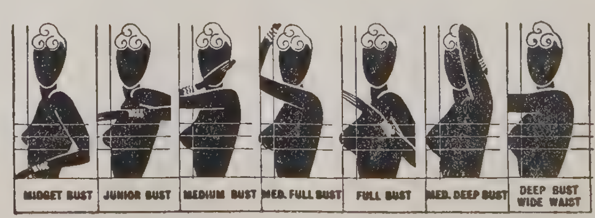

would have good armour to protect him.—**"Homespun," Halcombe.**

Highly Commended

"WISH wisely and wish well," runs the old adage, "for what you truly wish will come to pass." So I choose first a clean mind. Nothing can hurt or tarnish the character of children whose thoughts are clear and unsullied. So much of life's happiness depends on the kind of outlook we possess; and a child whose interest is centred on healthy, clean, and honest things will not stoop to furtive and underhand works. He who walks among the stars seems to wear a protective cloak about him against the power of evil. So, for my daughter I would ask nothing better than that her lovely youth may blossom unspoilt because of her pureness of mind. For my son, that he can face the world clear-eyed and unafraid.

My second choice is courage, so essential to the development of the best within us.

"Grant us the will to fashion as we feel.
Grant us the strength to labour as we know—"

strength to do right, to be steadfast and true no matter what comes. This I desire for my children, courage to remain unafraid.

And my last wish, so that they may be wise, generous and beloved, I choose compassion, embracing as it does understanding and love. Do I forget riches, cleverness, fame? No, but they do not make men great in the eyes of God.—**"Tiggetty Boo," Katikati.**

Competitions

JUNE

The closing date for the competition "If I Had a Magic Carpet—" is June 15.

JULY

Holidays are few and far between in wartime, but all manner of pleasant recollections spring to mind when we think of the holidays we have enjoyed in the past. Scenic tours; snow sports; camping; overseas travel—whatever form of vacation gave you most pleasure, share those memories with other "Good Neighbours" by entering for our July essay competition:

"HOLIDAY MEMORIES."

Entries to be in by July 15. First prize, 10/-; second prize, 5/-.

"MARY,"
"Journal of Agriculture,"
Box 3004, Wellington.

Highly Commended

I REMEMBER when I was a child how I longed to be able to imprint on paper every beautiful thing I saw, so that I could always remember it. I wish for my child, therefore, the gift of being able to paint what she sees, so that all the glorious things in her life may never be forgotten. And then I wish her to be kind to every creature, to remember that all men are brothers, and to feel the wonderful satisfaction of giving joy to those around her. And last, and, the most important, I think, I wish that she may know God and be able to open her heart to him and so feel the infinite peace which comes to those who trust him.

If my daughter could have these three wishes I am sure she would be happy always.—**"Ruth," Gisborne.**

Motherhood

. . . . There is one unblemished thing
I see,
Untouched by any lack, illumined and
whole
As is a dream emblazoning the soul.
O Motherhood, O mother's sesame
By which I know God's entirety
Of love, that is the marred earth's
aureole.

MY choice is:
Faith, to prove a lesson, to guide and solace till journey's end; courage, to remain steadfast, honourable, and true amidst difficulties and disappointments; understanding, to appreciate the efforts and failures of one's fellow-men, and to give a helping hand to those less fortunate in life's race.—**"C.V.W.," Waverley.**

I WISH my child to have the advantages in childhood which I did not have, also the strength of character shown by our pioneer ancestors. I would like her to possess the necessary "backbone" to stand up to adversity, and to develop the good temper so necessary if family life is to run smoothly.—**"Kirsty," Otago.**

MY three wishes for my child are: 1. A good all-round education; 2. a career that will prove a blessing to many of his fellows; 3. a cheerful disposition.—**"His Mum," Invercargill.**

ABOVE all, I wish for my son "peace on earth" and the right to live his own life untrammelled by fears and the oppressions of war.—**"Polly," Northland.**

I WISH that both my sons may lead a straight and honest life, doing unto others as they would desire others to do unto them. I hope they will study and follow the career which appeals to them, and not wander aimlessly through life.—**"Biddi-Jan," Cheviot.**

WHAT I wish for my child more than any other thing is a free world wherein to live, a world in which he could plan and be happy and not have his hopes dashed as mine and those of so many others have been; a world in which his most precious years are not spent apprenticed to the god of war.—**"Martha," Okaramu.**

IF I were a fairy godmother, I would wish my child the gifts of generosity, health, and joie-de-vivre. I consider generosity the highest expression of love. Great scientists have this quality, giving unstintingly of their knowledge and patience in the cause of research for the betterment of mankind. Mothers, too, in caring for their families, give of themselves in countless ways. The giving of love is the richest emotional experience for any human being.—**"Pegasus," Otago.**

I WOULD like my child to do one thing well above all others, so that she could earn her own security and independence.—**"Redwing," Auckland.**

I TRUST that my child will have happiness all his life—the happiness that comes from the joy of days well spent, work well done, and the companionship of good friends.—**"Fruffy," Te Awamutu.**

I WISH my child to become a useful, intelligent citizen, endowed with

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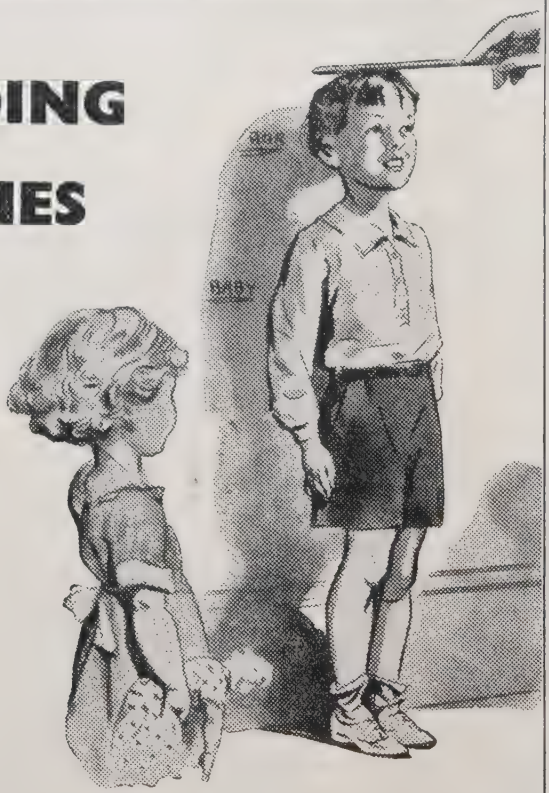
ISSUED BY THE DEPT. OF HEALTH

BUILDING BODIES



A building job slows down or stops if building materials are not available. Similarly the building up of a child's body slows down if the building foods are not provided for it.

WHICH ARE THE BODY BUILDERS?

Milk and cheese, eggs, fish and all kinds of rationed and unrationed meats. Also dried peas, beans, lentils and oatmeal which, though not quite so valuable are most useful additional builders, especially when eggs are in short supply.

When a building is finished, it must be kept in repair. The same building materials are needed for this, too. And when the human body is full grown, and all through life, it must be kept in repair by means of the same foods as were needed for growth.

HOW MUCH BUILDING MATERIAL IS NEEDED FOR MAINTENANCE AND REPAIR?

3-4 glasses of milk daily for the child and 2 glasses for the adult;
3 or 4 eggs a week, 1 a day for the children, if possible;
1 ounce of any type of meat or fish at 1 year of age — up to 3 ounces daily at least, for the adult.
After 18 months occasionally introduce grated, uncooked cheese.

In-between snacks of sweet foods cannot replace the solid building foods.

YOUR FOOD — DOES IT BUILD? DOES IT REPAIR?

19A

FOR A HEALTHIER NATION

the power to enrich life for all with whom he comes in contact.—**"Ladybird," Matamata.**

TO my child, whatsoever occupation he or she may follow, I would wish "a heart stout enough for the ups and downs of this wide adventure he is upon." I would give him those attributes of love, loyalty, and hope which would build his character, so that it could be said of him, "He too, was a gentleman." In the words of that beloved writer St. Francis de Sales, I would that my child should "cultivate a gentle spirit, humble and cheerful."—**"Roundabout," King Country.**

The mother's heart is the child's schoolroom.—H. W. Beecher.

I CHOOSE happiness. This comes from love, which I have already wished for my son, and includes, too, the gift of laughter which gives much joy both to oneself and others. I hope that he will find the right niche in life, the right work and hobbies, for to love one's work is to do it well and find pleasure in so doing. I once came across this "Recipe for Happiness":—

"To have something to love,
To have something to do,
To have something to hope for—
This is Happiness."

—**"E.W." Waiheke.**

◆

Preserving Autumn Glory

HAVE you ever felt that you wanted to preserve the beauty of those glorious shades found in beech leaves in autumn? Well, here's a method for you to try. Beech leaves make wonderful indoor decoration through the dreary winter months—put a bowl of them on a small table in a dark corner of your hall, and you will be surprised how that dark corner seems suddenly full of sunshine.

Gather the branches of the beech when they are just about to turn colour, and stand them in a jar with enough crude glycerine in it to cover the bottom of the branches for about two inches. Fill up the jar with water in the ordinary way.

The branches absorb a certain amount of the glycerine, and the leaves will stay soft, turning gradually to a rich golden-brown, instead of shrivelling and falling as they would do in the ordinary way. The water may be changed after a week or two, but no more glycerine is required. The branches will remain fresh throughout the winter months, and you will be delighted with this refreshing form of preserving autumn's glory through the winter days.

◆

Tonsils—Should They Come Out?

Contributed by
The Department of Health

AT some time or other the parent is liable to be faced with the problem of enlarged tonsils in the child—a problem that can be perplexing to the average person. Should they, or shouldn't they, come out? Well, that depends on certain factors which will be explained here.

Enlarged tonsils often get better by themselves—without any attention. Other times they upset the child and interfere seriously with his health. The tonsils are lymph glands which mount guard over the throat. They absorb germs and normally destroy them. Sometimes they get overwhelmed with germs. They become inflamed and swollen then, and the throat becomes sore. Temporarily the tonsils are full of germs—they've become damaged and enlarged. In a few days they get the upper hand. But it may take them a few weeks or months to get back to normal size.

Sometimes the tonsils lose the fight—they get so damaged that they stay enlarged. But they've managed to kill off the germs, and have enough reserve to deal with newcomers. They're still useful and should be kept. They don't cause any symptoms.

Secret Rainbows

I love not less the vivid, flaunting hues
Of dawn or sunset; the rich, velvet sheen
Of butterfly or rose; the changing blues
Of windswept ocean, fringed with frosty green.

But there are secret colours hid away
In ordinary things, of small esteem,
Whose finding lends new glory to the day—
A smiling fancy, or a fleeting dream.

What need of witch bowls, when my shelf is gay
With polished tumblers, gleaming row on row?
There rainbows lurk, and, on my wash-ing-day,
Wink gaily from the soap-suds' silver glow.

The blue of heaven spreads upon my floor
A fairy lake; and diamonds, red and blue,
Flash brightly in the shingle at my door,
While every paling wears its star of dew.

I envy none their pearls and jewels rare,
Nor any butterfly its painted wings,
For I see jewels shining everywhere,
And secret rainbows in the heart of things.

—Jean H. Mather.

Detecting Trouble

How are you to know when big tonsils are causing bother? Well, it's easy enough. Anybody can tell by looking into the throat whether the tonsils are enlarged, because in health they can't be seen as side projections at the throat entrance. If these big tonsils are affecting your child, you may see a little septic or yellow spot on them. If you feel a swelling outside on the neck, under the angle of the jaw, the tonsils are probably septic and draining to the second line of defence—those glands you feel. The child will be subject to frequent colds and sore throats and possibly headaches. He may become a mouth breather. He'll be pale and below par. You see, once the tonsils are diseased, each swallow carries some septic material down. These are the symptoms that signify danger from tonsils.

Enlarged tonsils often recover when left alone. When the trouble is over the tonsils slowly dwindle in size and become healthy again. On the other hand, tonsils often remain enlarged. In spite of this, however, they cause no symptoms and don't need removal. Quite a lot of people have this experience.

The important point about big tonsils is that they must come out if they are causing symptoms. If there have been repeated coughs and colds and sore throats with enlarged tonsils, and if there are enlarged glands in the neck, then have the tonsils removed completely. It's a waste of time to treat diseased tonsils.

Prevention

The prevention of enlarged tonsils depends on two things. The first is not always easy, but mothers and fathers can do more about it than they do. Keep your child away from those with colds and coughs and infectious troubles. And this means keeping your own child away from school when he has a cold.

If every parent would do just this, colds and sore throats wouldn't spread so much, the tonsils wouldn't have to kill so many germs, and wouldn't get enlarged as often.

The second thing in prevention is building a strong body so that the tonsils win the fight when overwhelmed with germs. Plenty of play out of doors, no stuffy rooms, windows open at night, daily bathing, and free use of handkerchiefs are the general hygiene factors that make for healthy throats.

A healthy way of feeding helps too. A common cause allowing colds, nasal infections, and sore throats is too much sugar and starch, and too little protein and protectives in the diet.

So review your children's diet. Is there too much bread, sugar, jam, sweets, and cakes; and not enough milk, cheese, liver, fruit, and vegetables? Enlarged tonsils are less frequent in children on a balanced diet. So increase the dairy products and vegetables and give cod liver oil in some form through autumn and winter.

What to do with Baby when travelling?

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solves the problem.

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Mary's at - Home -

WHAT we would do in the country without books I do not know. We are very fortunate in having a small library which caters splendidly for our requirements, and enables us to procure the best and latest editions. **—"Billie."**

I'VE been reading through a bundle of weekly papers. Have you ever re-read old letters before disposing of them and realised how clearly they show the characters of the writers? Perhaps one person is always wanting help in some shape or form; another frequently complains about her lot; another is inclined to belittle her relations, and so on. There are other correspondents whose letters are as good as a tonic. It struck me as being much the same when reading magazines in bulk—you get a much better idea of the nature of the publication. Where these particular papers were concerned I was most disappointed over the "pars." I wonder if writers realise how often they pass on the petty sayings and doings of their friends and neighbours. It is surprising how many spiteful acts are recorded and how few good. Slang words and expressions grate, too—why tolerate language which is second rate?—**"Cloudy."**

THE garden was a wilderness of weeds and rubbish when we came here. It had been sadly neglected, but last spring it was really beautiful with many bulbs, and wistaria over one end of the pergola and a mass of clematis (*Montana rubra*) over the other. I also achieved one of my ambitions, a hedge of French lavender, and behind it a row of most glorious winter-flowering sweet peas. The two combined were really a beautiful sight.—**"K.R.J."**

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I SHOULD so much like to congratulate "Faraway" on her choice and description of "Twelve Beautiful Things." I wonder if she has read "The Greatest Thing in the World," by Henry Drummond. In it he describes Love in a beautiful way, too:—"Love is Patience. This is the normal attitude of Love; Love passive; Love waiting to begin; not in a hurry; ready to do its work when the summons comes, but meantime wearing the ornament of a meek and quiet spirit. Love suffers long; beareth all things; believeth all things; hopeth all things—for Love understands, and therefore waits."—**"Autumn Tints."**

AN AUTUMN NIGHT

The solitude o'er the earth
And the night in frost;
Leaves are stirred with the scent
On a day long lost.
And the wind creeps on
With its cool breath shading
When sounds of the world have gone
And the low lights fading.
Till down an airway
In the dark Land of Gramarye
Blown from a stairway,
Floats a curtain free.
Look! Look! Dim human sight
Shall briefly know
With a strange wise delight
Some sight unheeded long ago.
Memory for briefest time
Comes to my call,
Brings me the gentle flower that pined,
Words that a voice let fall.
And wind and star
Show in the Lakes of Gramarye
Dark and far
As your eyes to me.

—**Mary R. Gullery.**

WITH each new book I read I feel that I am putting something new and beautiful into my life, for when the book is old and torn the words of the author will still be in my memory. **—"Book-lover."**

MY preserving isn't the bug-bear that it is to some housewives, as I only do six bottles at a time in the oven, note the time, and go away and do something else while the sterilising process is going on. The appearance and flavour repay one for oven bottling, and I seem to get such lots done this way. I popped 3 bottles of tomatoes into the oven today, straight from the plants, so am hoping to retain more of those elusive vitamins this way.

I have made such lots of small batches of jam, too. I have a lovely way for doing berry jams, and have found that the process makes the berries go much further, and the flavour is beautiful, especially with strawberries, etc., which tend to make a jam which is, to my palate, rather sickly sweet. I pick up all my windfall apples and make a liquor as for apple jelly, then after straining this, boil it in with the berries, add the sugar, and boil in the ordinary way. I get a beautiful "set," marvellous flavour, and at least three to four more pots out of the same amount of fruit.—**"L.A."**

HOW I enjoy reading this page and how numerous are the references to the garden being a place of solace amid life's difficulties. What is the reason for this mutual feeling? Perhaps it is the fresh air which acts as a balm for the mind in conflict; or that bed of pansies in the corner by the step. Our thoughts revert to other things: "The lawn needs mowing. How green and neat the grass seems under that walnut tree. The chrysanthemums should be staked—I'll get on with that now for there's barely an hour till tea-time." The sheer love of gardening compels us to forget our worries for a while. Thank God for a garden.—**"J.M.L."**

IT is very easy to become enthusiastic about one's own pet theories, and it does one a world of good to receive a new slant from the

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views of others who are interested likewise. It helps to mellow and broaden one's opinions. This makes me think of "Mary's At Home." I do hope it will continue to be a feature of our pages. Hearing about fellow "Good Neighbours" and their splendid ideas, gives this corner of the "Journal" a special place in our hearts. It is the very real human touch which counts so much."—**"Tiggetty Boo."**

WE have the loveliest dahlias, mostly grown from seed. They greet us with a blaze of colour when we arrive home. On the other side of the hedge we have scarlet runner beans mounting high, and very artistic they look, too!—**"M."**

……

Mother

I do not need this date in May
To call to mind your dear, sweet face.
Your memory lingers every day,
So gentle, kind, so full of grace.
In fancy still I see you sitting
By the fireside in your chair,
I hear your soft voice reading
To the children, listening there,
The lamplight softly gleaming,
The embers on the hearth so bright—
Ah, yes! sweet memories linger
As I sit and dream to-night.

—Emmie Nattrass.

……

I HAVE just made a plate of toffee for the kiddies, and Master Four has a rice pudding in the oven. He washes the rice and I strain it, otherwise I am afraid that as much rice as water would go down the sink. Then when he has got it ready I carry the piedish to the oven for him. Quite often he wants to make gingernuts, so I measure out the fat, sugar, and syrup, and allow him to work it up at the side of the stove until soft. Next I tell him the different ingredients and the amounts, and when he has finished the mixing I put them on the oven tray to cook. And isn't he proud when Daddy comes in to afternoon tea and he is able to say, "Look what I made." Quite often he asks if he can mop the passage and many a time he has made his own bed before I come up from the cowshed. In fact, I often go in to do his room and have been surprised to find his bed tidied up and the floor quite passably mopped.—**"Grasshopper."**

TELL all the "family" they can make excellent kindling wood by getting the young fry to help them (as I did, for a few pennies' wages) by tying up all the fruit tree prunings into good, old-fashioned faggots with flax or old string and then stowing them away safely. Next year when fires come round again you need only one sheet or so of precious paper with a couple of the faggots placed on top and you have a roaring fire in the twinkling of an eye. Put the bigger wood on afterwards.

I AM trying to teach my little girl, nearly eight, to be useful and interested in home things, so I often allow her to cream butter and sugar and help her to make cakes. One day I was making a good cake and she had creamed ½lb. butter and ½lb. sugar and then she had to wait till I had come in from putting the day's washing on the line, so she went on colouring in her book and left the creamed-up mixture on the bench. Meanwhile young two-year-old pushed a chair up to the bench and by the time I arrived he had "polished off" a good quarter pound of the basin's contents and covered himself and the cupboards and bench with the remainder. I didn't know whether I should have given him a dose of castor oil, but he didn't turn a hair. I was so amused that I forgot to be annoyed, but, oh, dear, in these days of saving up one's scraps of butter to make a special cake it was rather a heartbreak.—**"A."**

THANK you for the prize, Mary. It was quite exciting going to the bank to cash my cheque. Standing in the queue I saw one man receive £20, another person £15, a girl £7, and a young man held open a canvas bag while the teller threw in pound notes and emptied little tins of shillings and sixpences. Then came my turn. The teller's face did not move a muscle as he paid out to me four shillings and four pence. I was tempted to say, "I feel more like a millionaire than all the others." When I reached home the kiddies were very interested in my shiny new florins from the bank. I should like to congratulate the other "Good Neighbours" who took part in the competition. Most of their ideas were new to me, so I shall be trying them.—**"Mary Marie."**

Housewife and Teacher Too!

AS our farm is 8 miles from the nearest school and no school bus comes our way, my four children belong to the Correspondence School. To teach my children and at the same time manage my home without any outside help I have found that organisation of activities on both the scholastic and domestic fronts has been the keynote of success. It is a psychological fact that children need the discipline of routine, and derive satisfaction and peace of mind from the sense of security arising from the formation of regular habits. To cater for this need and also to ensure that the management of the home does not suffer I have found it necessary to evolve a time-table both for my children and myself from Monday to Friday inclusive.

Our large kitchen is also the schoolroom, and my husband has made each child of school age a little table with a top which lifts up. The children keep their lesson books inside these desks. Three-year-old John plays round quite happily indoors or out during school hours, and the older children realise that they must not play with their little brother in lesson time. Reading, writing, and sums are done in the morning, and the afternoon period is given to history, geography, drawing, and handiwork. The end of the school day is at 3.15.

The flower garden is my chief relaxation, and I usually manage to attend to it after school is out. Some days the children help me; other times we go for a ramble over the paddocks or down to the creek. I consider that education should not cater just for my children's mental needs, but for their physical and social needs as well.—**"Sunny."**

BATTLE-SCARRED BRITAIN!

BRITISH PEOPLE NEED FATS, MEATS, SUGAR.

For the past five years Britain and her people have known the full ravages of total war and although they are emerging triumphant from this experience, they still need the foods, we, in New Zealand have in plenty today. Their present fare could not be more monotonous. They urgently need Fats, Meats, Sugar, and protective foods for health. We can supply these.

Recipients in Britain may not ask their friends in New Zealand to send GIFT PARCELS of food stuffs, **it must come as a spontaneous gesture from you.** To meet this ever increasing demand we have established a "GIFT PARCEL SERVICE," in other words we have a series of some twenty parcels containing all that is most urgently required in the way of foodstuffs, all varying in contents and price. All you have to do is to send in to us the name and address of the person to whom you wish the parcel to be sent together with the required money order and we will do the rest.

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About Apples

In addition to containing health-giving vitamins (the peel is particularly rich in vitamin C) apples are the most versatile of all fruits for culinary purposes. They can be baked, stewed, fried, or scalloped; they have a distinctive flavour of their own, yet combine well with other foods; they can be pulped, preserved whole, or dried for winter use. They are delicious in puddings, pies and cakes; they can be used in salads, sandwich fillings, and savouries; they can augment your stock of jams and jellies, and add pleasant variety to your list of beverages.

Start the day well by giving your family apples in one form or another. Cut them into rings and fry with sausages or bacon. Sprinkle thin slices of apple with grated lemon rind and sugar, and cook them in batter. Serve them stuffed with minced liver and herbs, and baked; or scalloped with tomatoes and onions and breadcrumbs; or curried with raisins and parsley; or baked in syrup and with sufficient pulp removed to allow the hollow thus made in each apple to be filled with freshly-cooked oatmeal.

APPLE HONEY

1 apple, 1 lemon, 1 egg, 4oz. sugar.

Grate the apple and add to it the grated rind of the lemon and the juice. Stir in the sugar and the beaten egg, and cook over boiling water, stirring all the while until the mixture thickens. Do not allow it to boil. (1 tablespoon of butter may be added if desired). Use in the same way as lemon honey.

APPLE AND CHEESE PIE

Pastry, 1½lb. apples, ½ cup water, ¼lb. cheese, 2½oz. sugar.

Peel and slice the apples and arrange them in a pie dish. Sprinkle each layer with sugar and top it with the cheese thinly sliced. Pour water over. Cover with pastry in the usual way and bake ¾ hour in a good oven. Serve hot.

BIRD-NEST PUDDING.

Peel, core, and cut 6 large apples in halves, then lay pieces on their backs (hollowed side up) on a large buttered flat dish. Make a paste with 1 grated nutmeg and 1 tablespoon butter mixed stiffly with a little honey and fill nests with mixture. Make a batter with 3 eggs, 2 tablespoons s.-r. flour, 2 tablespoons sugar and 1 cup milk. Mix well, pour over apples and bake 1 hour.

APPLES IN BLANKETS

1 cup flour, 2oz. butter, 2oz. lard or dripping, pinch of salt, ½ teaspoon baking powder, 1 cup sugar, 1 pint water, apples, lemon peel, cinnamon, raw sugar.

Sift the flour and rub in the butter and lard or dripping. Add the baking powder and a pinch of salt, and mix to scone consistency with a little milk and water. Roll out on to a floured board and cut into squares. In the centre of each square place a teaspoonful of raw sugar and a little chopped lemon peel and cinnamon. Put the cored apple on top of this and wrap the pastry round it. In a baking dish make a syrup of the sugar and water and a small knob of butter, and when hot place the apples in this and bake in a moderate oven 40 to 45 minutes.

STEAMED APPLE PUDDING.

1½ cups flour, 3 tablespoons sugar, 2oz. butter, 1oz. lard or beef dripping, pinch salt, 1 teaspoon baking powder, apples.

Sift the flour and rub in the butter and dripping or lard. Add the salt, baking powder, and 1 tablespoon sugar, mixing all to a stiff dough with water. Line a greased basin with the pastry, leaving sufficient to form a crust for the top of the pudding. Now fill the basin three parts full with sliced apples, add the remaining sugar, and cover with the round of pastry. Place grease-proof paper over the top of the basin and steam 2½ hours.

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APPLE FLUFF

2½oz. sugar, 1 pint milk, 1 tablespoon gelatine, 1 lemon, 3 tablespoons stewed apples.

Dissolve the gelatine in a little hot water and add the juice of a lemon and the grated rind. Bring the milk to the boil, stir in the sugar and the gelatine mixture and leave to cool. When cool add 3 tablespoons stewed apples and beat well together. Turn into individual dishes to set. Sprinkle with chopped walnuts before serving.

APPLE SALAD

Apples, celery, nuts, lettuce, parsley, mayonnaise.

Chop equal quantities of eating apples and celery and arrange in mounds on lettuce leaves. Top with walnuts, and finely chopped parsley. Place a spoonful of mayonnaise (made with lemon juice, preferably) over each helping before serving.

APPLE SHORT CAKE

½lb. flour, 1 dessertspoon sugar, 1 teaspoon baking powder, 3 apples, 3oz. butter, 1oz. lard or dripping, 1 egg, milk.

Rub the shortening into sifted flour and baking powder. Beat egg and sugar together, mix into flour to a light paste. Cut in half, roll out one piece and place on tray. Cover with sliced apples, sprinkle with sugar, place other half on top, cover and brush with milk. Bake 20 to 30 minutes in moderate oven. Sprinkle with icing sugar, and cut while hot.

APPLE SANDWICH

8oz. flour, 1 teaspoon baking powder, 1oz. butter, 1 egg, 4oz. sugar, cinnamon, 1 apple, 1 gill milk.

Rub the butter into the sifted flour, add the baking powder and sugar, and stir in the egg and milk which have been well beaten together. Grease a sandwich tin and pour in the mixture. Cover it with thin slices of raw apple and sprinkle the fruit with a dusting of sugar and cinnamon. Bake in a moderate oven about ½ hour. Split into two with a sharp knife and butter the bottom half and spread with apple honey before replacing the top.

APPLE FRUIT CAKE

1½ cups flour, ¼ cup butter, ¼ cup lard, 1 cup stewed apples, 1 cup raw sugar, 1 teaspoon baking soda, ½ teaspoon nutmeg, ½ teaspoon cinnamon, ½ cup walnuts, ½ cup raisins, 1 cup currants, 1½ tablespoons lemon peel.

Cream the butter and sugar together, add the sifted flour and baking soda, the spices and stewed apple. Lastly add the fruit and lemon peel which have been previously floured, and then the chopped walnuts. Place in a greased cake tin and bake in a moderate oven for 1 hour.

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APPLE GEMS

¾ cup grated or chopped apple, 2 cups flour, 1½ teaspoons baking powder, 1 egg, ½ teaspoon nutmeg, ¾ teaspoon cinnamon, 6 tablespoons sugar, ⅓ cup butter, ½ pint milk, pinch salt.

Sift the flour, add the salt, ½ teaspoon only of the cinnamon, the nutmeg, baking powder, and 4 tablespoons of the sugar. Melt the butter and add to the beaten egg and milk. Mix this into the dry ingredients and blend in the grated or chopped raw apples. Fill greased gem-irons or muffin tins about ⅔ full and top each one with a slice of raw apple and a sprinkling of sugar and cinnamon. Bake in a hot oven for about ½ an hour.

CHOCOLATE APPLE CAKES

2oz. butter, 2oz. lard, 1 cup sultanas, 2 cups flour, 1 cup sugar, 1½ teaspoons baking powder, 2 teaspoons cocoa, 1 teaspoon spice, ¼ teaspoon nutmeg, 1 teaspoon baking soda, 1½ cups stewed apple.

Cream the butter, lard and sugar, sift in the flour and baking powder, add the sultanas, cocoa and spices, and lastly the baking soda dissolved in the apple pulp. Mix well together and bake in greased patty pans in a moderate oven. When cool ice with chocolate icing and chopped walnuts.

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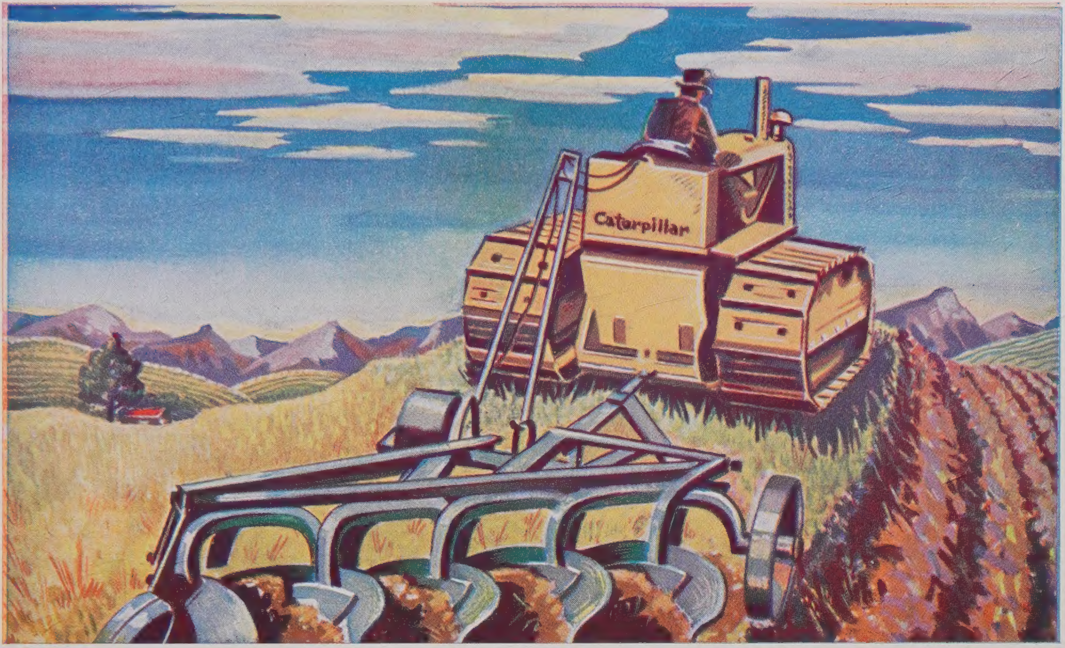

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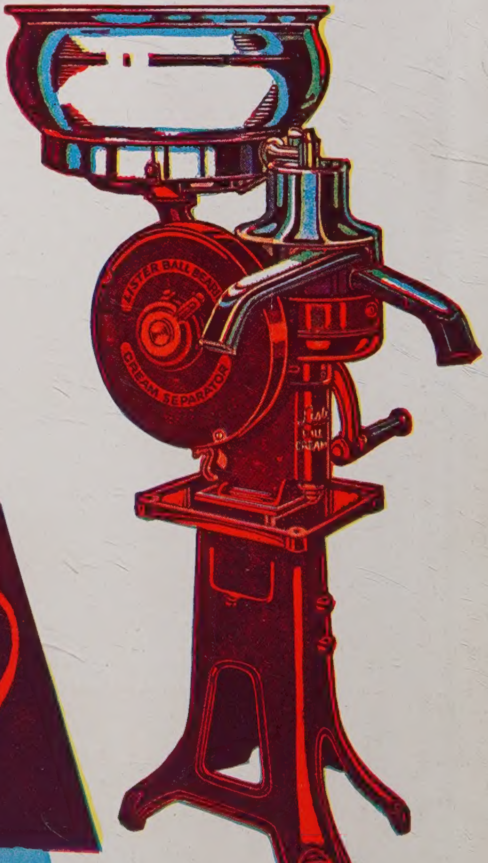

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